Fourteenth Biennial Report

of the

Board of Horticulture

State of Oregon

1917

"ALIS VOLAT PROPRIIS"

FOURTEENTH BIENNIAL REPORT

OF THE

Board of Horticulture

TO THE

TWENTY-NINTH

LEGISLATIVE ASSEMBLY

REGULAR SESSION

OF THE

STATE OF OREGON

1917

SALEM, OREGON:
STATE PRINTING DEPARTMENT
1917

MEMBERS OF STATE BOARD OF HORTICULTURE

	First District	
J. W. Pomeroy	- - - - - - - - -	Scappoose
	Second District	
Chas. A. Park	- - - - - - - - - -	Salem
	Third District	
Albert C. Allen	- - - - - - - - - -	Medford
	Fourth District	
C. A. Macrum	- - - - - - - - - -	Mosier
	Fifth District	
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Chas. A. Park	- - - - - - - - - - President
H. M. Williamson	- - - - - - - - - - Secretary
J. E. Stansbery	- - - - - - - - State Inspector

OFFICE OF BOARD: PORTLAND, OREGON

DISTRICT BOUNDARIES

First District

Multnomah, Clackamas, Yamhill, Washington, Columbia, Clatsop and Tillamook Counties.

Second District

Lincoln, Marion, Polk, Benton, Linn and Lane Counties

Third District

Douglas, Jackson, Klamath, Josephine, Coos, Curry and Lake Counties

Fourth District

Morrow, Wasco, Gilliam, Hood River, Crook, Sherman, Wheeler, Jefferson and Deschutes Counties

Fifth District

Umatilla, Union, Baker, Wallowa, Malheur, Grant and Harney Counties

COUNTY INSPECTORS

Baker County, Geo. A. Littlefield, Richland.
Benton County, vacant.
Clackamas County, O. E. Freytag, Oregon City.
Clatsop County, J. F. Sale, R. R. No. 1, Astoria.
Columbia County, Clark Grant, Scappoose.
Coos County, vacant.
Curry County, vacant.
Douglas County, Fred L. Strang, Roseburg.
Gilliam County, T. C. Mobley, Olex.
Grant County, vacant.
Harney County, vacant.
Hood River County, F. W. Angus, Hood River.
Jackson County, C. A. Noren, Medford.
Josephine County, C. D. Thompson, Grants Pass.
Klamath County, O. I. Gregg, Klamath Falls.
Lake County, vavant; O. B. Hardy, deputy commissioner.
Lane County, C. E. Stewart, Cottage Grove.
Lincoln County, S. G. Irwin, Newport.
Linn County, D. W. Rumbaugh, Albany.
Marion County, C. O. Constable, Salem.
Morrow County, W. E. Wallbridge, Heppner.
Multnomah County, C. O. Windle, 82d and Powell Valley Road, Portland.
Polk County, J. S. Parker, Dallas.
Sherman County, vacant.
Tillamook County, Ray C. Jones, Tillamook.
Umatilla County, J. C. Hopson, Milton.
Union County, vacant.
Wallowa County, Robert Day, Enterprise.
Washington County, A. V. Denny Beaverton.
Wasco County, J. P. Carroll, Mosier; H. S. Galligan, Dufur.
Wheeler County, vacant.
Yamhill County, vacant.

BIENNIAL REPORTS OF COMMISSIONERS

Report of Chas. A. Park, President and Commissioner for the Second District.

To the Honorable State Board of Horticulture:

I herewith submit to you my report for the term ending December 31, 1916, as Commissioner of the Second Horticultural District of the State of Oregon, which district comprises the counties of Linn, Lane, Marion, Lincoln, Benton and Polk. The portion of this territory which excels in the production of fruit lies mostly in the Willamette Valley, and it is of this part I will have the most to say.

The past year has been full of encouragement to the fruit grower. The crops of all kinds have been fair, and the demand and prices have been good. Many growers of gooseberries and strawberries report good returns on the crops produced, and have found a good market at the local canneries. The cherry crop promised a large yield, and of excellent quality, but owing to several rains during the ripening period of the cherries, a loss of at least forty per cent of the total crop was suffered. The canneries took nearly all of this product for canning purposes. The pear crop was about two-thirds of the normal crop. The quality was good and the prices were very good, the canneries taking all the Bartletts, and the fall pears were shipped East. The apple crop was fair as to quality. A somewhat increased yield was produced in this district, owing largely to the new orchards coming into bearing. Those having new orchards were greatly encouraged after the number of lean years waiting for their orchards to come into bearing. The prune crop was very good as to quality and quantity, and the prices better than normal. The loganberry production was greatly increased, and the people growing loganberries were more than satisfied with the results. Loganberry juice, a new fruit product, has been placed on the market as a beverage, which is being largely advertised throughout the country, and is meeting with much favor. A number of plants for manufacturing loganberry juice have been established in the Willamette Valley. Two of the largest are located at Salem, Oregon. During the past summer these two plants used nearly four thousand tons of the fruit in manufacturing loganberry juice. The favor with which grape juice was received by the people promises to give place in some respects to the loganberry juice. This outlet for loganberries promises to be the most satisfactory market, and the industry will surely grow, as the Willamette Valley is the ideal place for growing the very best berries of this variety. The canneries have had an exceptional run. They have been ready to can anything that would go into a can. The prospect is that they will have all of their stock cleaned up before the next season comes.

The most serious troubles that have come to the fruit growers of the Willamette Valley in the past two years are two, namely: Fire Blight and Cylindrosporium. Fire blight is so well known I feel that little need be said of its nature. The Willamette Valley has had the reputation of being free from fire blight. In the summer of 1915 there were several outbreaks of fire blight, and many isolated

cases were found. Most of the cases were found in the native underbrush, such as the wild crabapple, the hawthorne, and the service berry. Of the cultivated trees, the quince was the most susceptible. As soon as the fire blight was definitely known to be here, inspectors were quickly placed in all of the counties and a thorough inspection was made. The inspectors did not stop to serve notices upon the owners of the property where fire blight was found, but, being armed with saws and axes and corrosive sublimate for sterilizing purposes, were ready and did immediately remove and destroy all cases of fire blight found by them. I do not mean by this that drastic measures were taken, but immediate and effectual methods were used, and all of the work was done in a spirit of cooperation with the owners of the property. In making the inspection, the inspectors kept a full and complete record of every case of fire blight, and located the same on a map of the respective counties, so that they have been able to return to each location for follow-up inspection. This method of dealing with the fire blight has proved very effectual, as very few cases have been found during the season of 1916. The second trouble which I alluded to above, took up its abode with the prune growers. For several years the prune growers had noticed that the leaves on their prune trees would wither and fall. After this the prunes would stop growing and would fall; thus a serious loss was suffered by many orchards. Scientific investigation revealed the fact that a fungus known as the cylindrosporium would attack the leaves of the prune trees as the dry season of the summer approached, with the result as noted above. The Department of Plant Pathology of the Oregon Agricultural College carried out an investigation and experimentation as best they could with the limited means on hand, and have demonstrated that the disease can be controlled by three applications of the Bordeaux spray at the proper times. I will say that this appears to be the result of the investigation work for the one season of 1916. You must bear in mind that one season's work in experimentation does not prove a settled principle. The last Legislature failed to make the proper appropriation for the Crop Pest Fund which was granted several years ago for the experimental departments of the Agricultural College to carry on such investigations, and while they had the use of funds from this appropriation they were able to do some very effectual work which proved of great benefit to the State. Coming in contact with the practical workings of this measure, I can positively speak of the good results, and I hope that the incoming Legislature will see fit to restore the crop pest fund.

As President of the Oregon State Board of Horticulture, I wish to state that the last Legislature changed the horticultural laws in some respects. One change was to eliminate the president and commissioner at large, thus doing away with one member of the Board. A provision was made that a president should be elected from among the five commissioners, who should preside at the meetings of the Board and perform a few of the duties which devolved upon the president and commissioner at large of the Board before the change.

California Tuber Moth of the Potato

For several years past, there have been shipped to Oregon from outside states potatoes which were infested with tuber moth. Since Oregon was free from this pest, and the introduction of tuber moth into this State would cause a great economic loss to the potato growers, it was found necessary to issue two quarantine regulations. These regulations were issued after the most careful consideration of the matter of protecting our own people from a new and serious pest, and were not promulgated from any spirit of animosity. Since the declaration of the quarantine, there has been no cause for complaint against any shipment of potatoes which came into this State with the certificate of the California inspector. The quarantine regulations as above referred to, are herewith set out in full:

Oregon State Board of Horticulture Notice of Quarantine No. 3

The fact has been determined by the president of the Oregon State Board of Horticulture that a dangerous insect pest, injurious to the common potato, which is commonly known as the potato tuber moth or potato tuber worm (Phthorimoea operculella, Zell.), new to and not heretofore prevalent or widely distributed within and througout the State of Oregon, exists and is widespread in the State of California, and that, to prevent the introduction and spread of said pest in the State of Oregon, it is necessary to forbid the importation of potatoes from California except under the conditions hereinafter set forth:

Now, therefore, I, Chas. A. Park, president of the Oregon State Board of Horticulture, under the authority conferred by Section 1 of Chapter 246 of the General Laws of Oregon of 1913, and Section 4 of Chapter 342 of the General Laws of Oregon of 1915, do hereby prohibit the importation of any common potato or potatoes from the State of California into the State of Oregon, except under the conditions hereinafter specified, and from and after the publication of this notice in three newspapers published in the State of Oregon it shall be unlawful for any person, firm or corporation to transport or bring any common potatoes from the State of California into the State of Oregon except under the following conditions:

1. Every shipment of common potatoes from the State of California to the State of Oregon must be accompanied by a certificate of inspection signed by a county horticultural commissioner or other duly authorized horticultural inspector of said State of California, certifying that he has inspected the potatoes in said shipment and found them free from the potato tuber moth, its larva or pupa. Such certificate shall be signed in writing and shall specify the locality where said potatoes are grown; the date of inspection, and the number of sacks, boxes or other containers included in the shipment inspected.

2. Every shipment of potatoes grown in California which is brought into Oregon must be brought to the city of Portland, and must be held at the wharf, dock, railroad yards, freight depot or express company's depot or office of the common carrier bringing such potatoes into the State until said potatoes have been inspected by the

State Inspector of the Oregon State Board of Horticulture or by some other duly authorized inspector working under direction of the said State Board of Horticulture, and permission has been given by the inspector making such inspection to deliver the potatoes. The common carrier, person, firm or corporation bringing potatoes into Oregon which are grown in California must notify the State Board of Horticulture or the State Inspector of said Board of the arrival in Portland of such potatoes and hold the shipment as hereinbefore provided.

3. If, upon inspection, any of the potatoes in any shipment are found to be infested with the potato tuber moth, its larva or pupa, or show indications that they have been so infested, the person, firm, or corporation who has brought said shipment of potatoes from California to this State must take said shipment of potatoes back to California within four days from the date of inspection of said potatoes in Portland, provided that if the infestation shall be in such condition that the inspector believes there would be danger of escape of the potato tuber moth from the shipment in course of transit through the State, the person, firm or corporation bringing the shipment into the State will be required to destroy the shipment, including the containers, by burning the same.

Done at Salem, Oregon, this twentieth day of January, 1916.

CHAS. A. PARK,
President of the Oregon State Board of Horticulture.

I, James Withycombe, Governor of the State of Oregon, do hereby approve the foregoing promulgation.

JAMES WITHYCOMBE,
Governor of the State of Oregon.

The foregoing regulations have been modified so as to permit the bringing of potatoes grown in California to the following additional points in Oregon for inspection: Astoria, Salem, Eugene, Roseburg, Medford, Klamath Falls, Lakeview.

In the early part of the year, 1915, the fact was definitely established that the potato disease known as the Powdery Scab of Potatoes had established itself in Tillamook County in this State. This disease had not previously been found in Oregon and was not known in any other county in the State. The State Board of Horticulture was advised by the Federal Horticultural Board of the United States Department of Agriculture that the disease was a dangerous one and for the protection of the potato industry in other portions of the State the following quarantine was established:

Oregon State Board of Horticulture, Notice of Quarantine No. 2

The fact has been determined by the President of the Oregon State Board of Horticulture that a dangerous potato disease known as the Powdery Scab of Potatoes (Spongospora subterranea), new to and not heretofore widely prevalent or distributed within and throughout the State of Oregon, exists in the County of Tillamook in the State of Oregon;

Now, therefore, I, Chas. A. Park, president of the Oregon State Board of Horticulture, under the authority conferred by Section 2, of

Chapter 246 of the General Laws of 1915, and Section 4, of Chapter 342 of the General Laws of 1915, do hereby quarantine the said County of Tillamook, and from and after the publication of this notice in a newspaper published within said County of Tillamook, it shall be unlawful for any person, firm or corporation to carry or transport any common potato or potatoes from the said County of Tillamook into or through any part of the State of Oregon, outside of said County of Tillamook.

Done at Salem, Oregon, July 13, 1915.

CHAS. A. PARK,
President of the Oregon State Board of Horticulture.

Executive Office, Salem, Oregon, July 13, 1915.

I, James Withycombe, Governor of the State of Oregon, do hereby approve the foregoing notice of quarantine and designate the Tillamook Headlight, a newspaper published in said County of Tillamook, as the newspaper in which said notice shall be published.

JAMES WITHYCOMBE,
Governor of the State of Oregon.

Recent reports of the investigations of the Federal Horticultural Board lead me to believe that this quarantine against the shipment of potatoes from Tillamook County may soon be annulled without serious detriment to the potato industry of the State.

White Pine Blister Rust

Within the past few years a disease known as the White Pine Blister Rust has established itself in the eastern portion of the United States where it is doing great damage to all five-leafed pines. Oregon's forests of five-leafed pines including the western white pine and the sugar pine are of immense value. For the protection of these forests it appeared necesary to prohibit the importation of five-leafed pines from any locality not known to be free from this disease. It was necessary to include in this prohibition all varieties of currant and gooseberry bushes as they are subject to the disease. The following quarantine was therefore established:

Oregon State Board of Horticulture, Notice of Quarantine No. 4

The fact has been determined by the president of the Oregon State Board of Horticulture that a dangerous disease of pine trees, known as the White Pine Blister Rust (Peridermium strobi, klebahn), not heretofore prevalent in nor distributed within the State of Oregon, exists in many foreign countries and throughout a large portion of the United States east of the Mississippi River, which disease attacks all five-leafed pines and all currant and gooseberry plants;

Now, therefore, I, Chas. A. Park, president of the Oregon State Board of Horticulture, under authority conferred by Section 1, of Chapter 246, of the General Laws of 1913, do hereby prohibit the importation from any and all foreign countries and from all portions of the United States east of the Mississippi River, of all trees of five-leafed pines and of all species and genera of currant and gooseberry plants and cuttings

The best known five-leafed pines are Pinus strobus, white pine; P. monticola, Western white pine; P. lambertina, sugar pine; P. flexilis, limber pine; P. albicaulis, white-bark pine; P. strobiformi, Mexican white pine; P. balfourina, foxtail pine; P. aristata, bristle-cone pine; P. cembroides, pinon pine; P. excelsa, Hymalayan pine; P. pence, Balkan pine; P. armanda, Chinese white pine; P parviflora, Japanese white pine; P. cembra, stone pine; P. koriensis, Korean pine.

Done at Salem, Oregon, this 24th day of July 1916.

CHAS. A. PARK,
President of the Oregon State Board of Horticulture

I, James Withycombe, Governor of the State of Oregon, do hereby approve the foregoing promulgation.

JAMES WITHYCOMBE,
Governor of the State of Oregon.

Executive Office, Salem, Oregon, July 24, 1916.

CHAS. A. PARK,
President and Commissioner for 2nd District.

Salem, Oregon, December 30, 1916.

Report of J. W. Pomeroy, Commissioner First District.

To the Honorable State Board of Horticulture:

I herewith submit my report for the two years, 1915 and 1916.

On account of the uncertain market conditions of the last two years and the resulting diminished interest in horticulture I have not attended a great number of fruit displays and horticultural meetings during the past two years. A large part of my time has been spent in cooperation with the several county inspectors in an effort to clean up bad disease conditions and in reviving interest in the old home orchard.

All of the counties in my district, excepting one, have been liberal enough in providing funds for inspection work, but owing to the high wages in all lines of work it has been very difficult to maintain the services of competent men in some of the counties. Yamhill County has not provided the necessary funds and so far this county has been our most serious problem. This county at one time grew more apples perhaps than any other county in the State, and most of these trees are still standing. For the past ten years a large part of these trees have not been cared for. They have become infested with nearly every known apple disease. In these same districts are large plantings of young apple trees and their owners are doing everything possible to bring these trees into profitable bearing, but they are continually confronted with the problem of these old infested trees. I have received many appeals for help from these men, and I have made every reasonable effort to get the cooperation of the county officials of that county and so far I have been unsuccessful. These officials are not fruit men and have no sympathy in that direction, and this, together with the predominating influence of the other classes of farmers render them almost deaf to the appeals of

the orchard men. The prune growers are in a class by themselves and their problems are separate from those of the apple grower and therefore their sympathy is not easily enlisted in behalf of the apple grower.

I have been much discouraged over the apple situation in the first district the last two years, for the low prices coupled with the extremely bad disease conditions have caused growers in general to lose heart. As a result many old orchards as well as new plantings have been taken out and the task of getting the remainder properly sprayed and cared for has been an uphill job. I am speaking now of conditions in general. There are certain localities such as Garfield in Clackamas County, Scappoose and Warren in Columbia County, and certain parts of Washington and Multnomah Counties that have not been influenced by the depression and as a result have made a fair profit on their crops. Prices this year are exceptionally good for clean fruit and I believe a new activity in horticulture is at hand.

The prune is the most important commercial crop in the first district and the past two seasons have been exceptionally good for the grower. Last year the crop was not heavy but the size was exceptional and the price good. This season brought a heavy crop and an unusually good price and the weather conditions were ideal during the harvest so that there was scarcely any loss through cracking. There was some loss, however, from scab. Hundreds of acres of new plantings are coming into bearing and hundreds of new orchards are going out, but with the better handling methods now being undertaken and the constantly increasing demand little fear is being felt for the future of the prune.

The first district is rapidly becoming a large producer of loganberries and the industry bids fair to attract much capital. The prices this season were very attractive and buyers have offered to contract the crop as much as five years in advance at a three cent rate; this will stimulate an increased planting and a large output is expected during the next few years.

Walnuts and filberts are being widely planted in this district and the prices offered this year are so attractive that I expect a great development in this branch of horticulture during the next few years, especially in Yamhill, Clackamas and Washington Counties.

I earnestly believe that the horticultural depression is leaving this part of the west and that through more careful planting and better organization we shall soon be enjoying a real horticultural prosperity.

J. W. POMEROY,
Commissioner First District.

Scappoose, Oregon, December 30, 1916.

Report of Albert C. Allen, Commissioner for the Third District.

To the Honorable State Board of Horticulture:

I respectfully submit my report for your consideration. The horticultural and agricultural conditions in the Third District show a gratifying improvement at the present time. Diseases and pests are being held under control and the growers generally are handling

their operations with more economy and better methods. Gratifying advances have been made as a result of closer cooperation of all concerned and I believe the industries as a whole are settling down to a firmer business basis.

Where the hard times have been disastrous to some, in the main I believe it has helped to bring about a firmer foundation to the fruit industry in that it has caused the elimination of a large number of speculators and the destruction and removal of many worthless orchards. I have made an effort to encourage the growers to remove undesirable varieties or graft them over to varieties which can best be grown in their district. I believe if each district throughout the country would grow only those varieties which are best suited to their soils and conditions it would aid materially in making a success of the industry. We have succeeded so far in having a large number of worthless trees either pulled out or grafted over.

I have been, as always, deeply interested and a firm believer in cooperation and have lent my efforts, wherever possible to secure it. I feel that something should be done to encourage Federal and State aid in the thorough organization of growers and every effort should be made for us all to work in hearty cooperation and support of the Federal Office of Markets. Organization has been worked on for years and is nothing new. Many plans have been made and failed or have been partially successful in our State. After many years study of the situation I have come to the conclusion that the one way in which cooperation and thorough organization can be accomplished will be through Federal and State aid. Work along these lines is now being carried out and it is to be hoped that we can all get together in this way.

The standardization of grades is a subject that is receiving acute attention throughout the Northwest and State or Federal standardization is being strongly advocated.

Inspection.

The first subject which commanded my attention when appointed as a member of the State Board of Horticulture, in December, 1914, was that of inspection. I immediately started a reorganization of the inspection forces in the large fruit sections to put them on a sound and economical business basis. The first was Jackson County which, with its very large acreage in fruit, and its strenuous efforts to combat diseases in its orchards, was most in need of immediate action.

It was found upon examination that the county had upon its payroll the names of thirteen inspectors. Eleven of these were still employed in the month of July, seven in August, and six during the remainder of the year. Believing that less men could handle the situation better under more efficient methods, I requested the county court of Jackson County to relieve all but three inspectors, and in so doing abolish the office of chief inspector. In the meantime I had had a conference with the county court and they gave me hearty support in the reorganization. Dr. M. P. Henderson was at this time county pathologist and I appointed him deputy horticultural commissioner for Jackson County, to serve without compensation. This

gave him full authority and the inspection force was immediately placed under his direction.

The county was made into four districts and each of the three inspectors was assigned his district and given explicit directions as to his duties, etc. A fourth inspector was appointed early in 1915 to take the fourth district. We then drew up and had printed three small books with perforated leaves and arranged for making carbon copies. They were the inspectors' daily reports, miscellaneous inspection reports and an official notice book. Below is given the three reports in detail.

Inspector's Daily Report.

Date .....

Orchard visited .....

Location .....

.....

Time of Entering.....Time of Leaving.....

Character of Work Undertaken.....

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Condition of Orchard.....

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Efforts Made to Control Pests.....

.....

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Recommendations .....

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.....Inspector

Received by .....

Miscellaneous Inspection Report

Date.....

Stock inspected .....

.....

Quantity .....

Source of stock.....

.....

Destination of stock.....

.....

Place of inspection.....

Time required for inspection.....

Condition of stock.....

.....

.....

Recommendations .....

.....

.....

.....Inspector

Signed by..... { Consignee / Consignor

Horticultural Commission of Oregon, Third District

Notice to Disinfect Orchard

Mr.....

Agent, Owner or Lessee.

You are hereby notified that from a personal inspection of fruit trees made by me this.....day of....., 191...., within your premises of the following described land.....in Section.... Township...., Range.... West-East of the Willamette Meridian, in Jackson County, Oregon, I find trees diseased with..... and infested with ....., which pest....is-are a menace to the fruit industry of the State of Oregon and I declare the same to be a public nuisance.

You are hereby ordered to abate said nuisance between date of service of this notice and the ..... day of ....., 191...., by.....

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In the event you wrongfully ignore and neglect this order, it will be my duty to summarily condemn and destroy said diseased trees, and to report said disobedience, together with the evidence, to the District Attorney for prosecution as provided by amended Section 4185 of the Codes and Statutes of Oregon, as compiled and annotated by Charles B. Bellinger and William W. Cotton.

.....

Commissioner Third District

.....

Deputy County Inspector.

Date of service.....191....

By examination of the above it will be seen that these reports give an absolute account of everything done by the inspector and the time and date at which it was done. The inspectors were notified that these daily reports must include everything which might prove of interest or value to the office, such as the finding of any insects, animals or pests of any kind doing injury; also the physical condition of the orchards and the efforts being made to care for them. In fact it is required that everything affecting the care or welfare of the orchards should be written in this report.

The miscellaneous report is used for inspection of nursery stock, etc. These reports were made uniform in size and to fit a card filing system which was installed in the county pathologist's office by the county court. In this cabinet all reports are promptly filed and preserved and these records have proven of great value. The official notice was drawn up by the district attorney in Jackson County, so that in case of liens we would have some method of recording them. I have found that there is no provision under our horticultural laws for the filing of such liens nor any designation as to the priority of such liens over mortgages, etc. Undoubtedly these liens were supposed to rank with labor liens, as most of the money paid out in

such cases is for labor. We are at present at work on a modification of the Horticultural Laws, to be presented, so as to establish a Horticultural Lien Docket and provide for the priority of such liens, etc. It is hoped that the Legislature will adopt this, if submitted, so as to clarify the subject.

In 1914 I found that each of the inspectors in Jackson County was drawing a per diem of three dollars and was allowed the sum of three dollars for automobile and all other expenses. Up to that time this seemed to be the most economical method of handling the expense account. These inspectors had practically no districts and were under the immediate and sole charge of a county chief inspector. No records of their work was kept, and I found that we had absolutely no records of past performances except the meager reports made to the county court by each inspector in his claim for services. Investigation showed that it was the custom for several inspectors to go out together in one automobile and all inspect together in a "tree to tree inspection." Their work consisted in not only finding the infected orchards, in the case of pear blight, but to actually cut it out in certain cases. This was not a fault, in my opinion, of the inspectors, or any particular individual, but it was a fault of the system.

The district plan which we instituted, did away with this in that no inspector is allowed to inspect within the boundaries of another inspector's district without the direct orders of the county pathologist or the Horticultural Commissioner. This prevents any duplication of work and each man is held accountable for the condition of his district. Also each inspector is compelled to own his automobile and operate it in the service and he is allowed the sum of $2.25 per day up to $2.50 in the case of a widely scattered district, for automobile and all other expenses in addition to his regular $3.00 per diem as allowed under the law.

Inspectors were then forbidden to cut out blight or perform any other service for the grower other than inspection and proper instruction. In the case of enforced "clean-ups" the inspector merely gets the men, sees that the work is done, and the county court allows and pays the bills which become a lien upon the property.

By a rigid enforcement of systematic inspection, the four inspectors have been able to satisfactorily police the entire orchards of Jackson County up to the present time. It may be that in the future a few more men will be required at certain seasons, but for the present we have found the force adequate. The total fruit acreage for Jackson County is over 23,516 acres.

In the year 1914 (preceding my appointment to the State Board of Horticulture), the cost of fruit inspection in Jackson County, exclusive of the amount paid for county pathologist was $14,624.59; the cost in 1915 for all inspection and expense connected therewith under the new system totaled, exclusive of amount paid for pathologist, $4,528.34. This was a total saving to Jackson County of $10,096.25 for the year.

The expenditure for 1916 will be practically the same as in 1915.

Practically the same system of inspection has been installed in Douglas County, but unfortunately, up to date, a filing system has not been provided for the reports. The fruit industry in this county is an important one and is growing steadily. But one inspector is at present employed in the county, and owing to the fact that fire blight has not yet gotten a foothold there he has been able to handle the situation in a very satisfactory manner.

Of course, owing to there being but one inspector in the county, a great deal of his time is required for advisory work, and though using an automobile, it is a hard matter to cover the vast territory enclosed within the boundaries of the county. I hope that in the near future the county will realize the great value to itself in the industry and will add a county advisor in addition to the inspector.

In Josephine County the fruit inspector has been superseded by a county advisor who is looking after both the inspection and the advisory work. There is quite a large acreage of fruit in this county and it is one of the most important industries. The county is in need of both an inspector and a county advisor for fire blight and other diseases have already obtained a footing here and will require stringent methods in the future if the industry is to be preserved. Besides the growers are in need of advice, and the experimental work which a county advisor can give, in addition to the police part of the inspection.

In July, 1916, I appointed a deputy in Lake County to inspect all potato shipments into that county, as there was no fruit inspector.

In Klamath County there has been appointed, at my recommendation, a fruit inspector, whose duties at present, are devoted almost entirely to the inspection of imported potatoes. The matter of extending the inspection will rest largely upon future developments in the county.

Curry County has no inspector at present, and as the county court has removed the inspector in Coos County, there is none in that county. It is probable that there will be one appointed in the latter county at some time in the near future.

One of the most important moves made by the State Board of Horticulture in 1916 was the quarantine placed by Governor Withycombe and the President of the State Board on California potatoes on account of the prevalence of tuber moth in California. Under this regulation there were five points in the third district where potatoes were permitted to be imported subject to inspection. These points were Roseburg, Grants Pass, Medford, Klamath Falls and Lakeview. Accordingly rigid inspection was made at all these points. Practically no California potatoes were imported from California into Roseburg, they getting their supply from Portland. In each of the other points quantities of potatoes were inspected. Klamath Falls received the bulk of these shipments and a number of infested shipments were condemned and shipped back on the next train. In Lakeview and Medford a number of condemnations were also made. From one shipment received at Medford two potatoes were taken to the office of the Jackson County pathologist and were placed in a jar tightly closed with cheesecloth, and over this was placed a bell jar.

From these two tubers something over two hundred moths and larvae were hatched in a comparatively short time. This experiment plainly showed the rapidity with which they reproduce and the great danger to the State of Oregon, should this pest be allowed to get a foothold.

I have ordered all inspectors in my district to keep a close watch on all potatoes on the market and in the field and to report immediately if anything resembling a tuber moth or its larva be discovered so that prompt steps may be taken for its eradication. Owing to the fact that I had received information that some California potatoes were likely to be shipped into Lake County, as Nevada potatoes (being reshipments from Nevada points), I notified railroad and express agents to hold all potatoes for inspection from any source whatever outside the State of Oregon. I believe that this matter is of such vital importance to the State that every effort should be made to keep this pest out. I feel certain that if this quarantine is not rigidly enforced throughout the State, within a short time the potato crop of Oregon will be in grave danger. To this end I hope that the Legislature in its wisdom will provide adequate means for the carrying out of this as well as the enforcement of all the horticultural laws. The experiment which we made at Medford, where two potatoes soon produced over two hundred moths and larvae is appalling in its results and warning.

In Douglas, Jackson and Josephine counties inspection work has been pressed and good results have been obtained. A number of trees and small orchards of diseased or infested trees have been condemned and removed in all three counties, but only in Jackson County have there been any liens filed for work so done. Owing to the number of absent owners in Jackson County it was found necessary for the county inspection force to enter and condemn certain trees or orchards. Men were put to work and a thorough removal of the condemned trees were effected and liens filed against the properties. Some of these bills have been paid by the owners of the properties, but some remain to be collected. Owing to a misunderstanding of the law, no efforts were made to collect some of these, while others are still pending. However, every effort will be made in the near future to collect these bills or foreclose the liens.

Through the inspection force of Jackson County a complete orchard census has been made. This gives in detail varieties, ages and acreage of all important fruits in the county. An orchard census was also taken by the inspector in Douglas County. Besides this a large amount of valuable data has been collected both in horticultural and agricultural lines through the work of the inspectors.

It is manifestly impossible to obtain the best results in inspection without cooperation. It is gratifying, especially in Douglas, Josephine and Jackson counties, to have received the hearty cooperation of both growers and the several county courts. In all of the counties in the third district, except Curry and Douglas, are county agents, whose work in agricultural lines has been a material aid and benefit to them. It is to be hoped that these two counties will make arrangements for such an office in the near future.

A very large amount of nursery stock is inspected each year in my district. Under the old system in vogue a certificate of an inspector accompanied each bundle, certifying that the "within plants and scions were inspected and that the same were found free of all injurious insect pests and fungous diseases." These were printed upon shipping tags and were furnished to the inspectors who often signed a large number and handed them over to the nurseryman to place upon the bundle. Naturally abuses arose.

In order to simplify matters I brought the matter before the State Board of Horticulture, at one of its meetings, and it was decided to abolish the old certificates of inspection and issue a general one instead. This certificate is as follows:

> "I hereby certify that the ——— nursery, located at ———, was inspected on the ——— day of ———, and is believed by the inspector to have been free from dangerous insect pests and diseases at that date."

This is signed by the horticultural commissioner of the district, per the inspector issuing it. In this way it permits the nurseryman to export his stock, after his nursery has been inspected, without the annoyance of hunting up an inspector for each shipment. Besides, the expense attached to such inspections at the initial point, which was great in some counties, was done away with.

Owing to the fact that the greatest danger lies entirely with the incoming nursery stock, a rigid inspection at point of arrival is required of every shipment whether it comes from within the State or without. The fact that another inspector's certificate of inspection is on the bundle does not in any way prevent the inspection at the point of arrival and no heed is paid to such certificates.

Frost

In the spring of 1916 a decided reaction in the matter of frost fighting was noticeable in the Rogue River Valley. This had its inception in the circulation of the fallacy that the smoke and soot from the oil pots caused injury to the foliage. This statement would not have been credited to such an extent that it was but for the fact that money was so tight that some of the growers were grasping at any straw to lower their expenses. Therefore smudging was not as general in the Medford district as it had been previously.

Several severe frosts came during the spring and those who did not fire were injured. In some cases it amounted to a total loss of the crop, in others a partial loss. This difference was occasioned by several factors. The location above the frost belt helped many and the smoke from the fires of those who did fire helped to save those who did not, by preventing the full strength of the sun's rays from thawing out the frozen fruit too rapidly. There is no doubt but what orchard heating will be generally resumed next spring.

Fruit Diseases and Pests

Fire blight has been prevalent in Jackson and Josephine counties for several years past but it has always been kept under control. In

the spring of 1916 an outbreak of blight swept over both these counties and a determined fight was made to check it. In Jackson County, owing to the larger acreage and congested areas of fruit trees, it was the most serious. An active campaign was waged and in most cases it was controlled without a very serious loss. However, there were some sections which were severely damaged and a few cases, where no proper methods were used, the results were disastrous. In some cases the owners of these badly infected trees have removed them or are doing so and others have been condemned and will be removed. As a whole, conditions are satisfactory.

The infections were not confined to pears alone, but were exceptionally bad in both the Spitzenberg and Newtown apples. Though it may have occurred before, yet I have never seen the infection so virulent in the Newtown trees as in the spring of 1916. In many orchards it seemed as if every fruit and spur was infected and globules of ooze stood on the apples. In many cases also the entire crop of Spitzenbergs were lost by spur infection.

Weather conditions contributed their share toward making the fight a hard one as the spring, about the blossoming time, was cool and moist, allowing the blight to run a long ways before becoming visible to the eye through discoloration or wilting of the bark and leaves.

It was clearly demonstrated during the past season that in the districts where a thorough root cleaning had been made, over a considerable area, the blight was not nearly so bad as where no great amount of root cleaning was done. In several orchards Mr. Claude C. Cate, Jackson County pathologist, made observations and experiments with insect repellants in an endeavor to prevent infection. It was found that in practically every case where sulphur had been applied as a repellant, at or near the crown of the trees (six or eight inches below the surface), the trees had been but little infected with blight and hardly a tree had been infected seriously in the roots. Though the experiments have not been carried over sufficient length of time to absolutely settle the question, yet it seems at this time to be a source of great promise in the matter of an aid to the control of blight infection. In the rows of trees treated with the sulphur, practically no insects were found working around the base of the trees but on the check trees large numbers of click beetles, ants and other insects were present and there were many cases of root infection, undoubtedly due to their presence.

It seems that if a thorough cleanup of the root systems is made throughout a district, sulphur placed around each tree and all hold-over cases removed from the tops, it will be comparatively easy to control the blight situation. A thorough investigation by Mr. Cate of oil sprays as a repellant was made in certain California sections and will be tried out in an experimental way in the next season. Both this and the sulphur application gives promise of aiding the grower to control the blight by repelling the insect carriers of the germ. The writer has, for a number of years, used insect repellants successfully, on the fresh cuts where large infections of blight have been removed. The blight was cut out in the regular way, disinfected

with corrosive sublimate and then the wound washed with Kreso sheep-dip, a mixture of whale oil soap and carbolic acid, or some other insect repellant. This is to keep the insects away from the "bleeding" wound until it has had sufficient time to heal or dry up.

Many infections, especially in the Anjou pear, have been found to have been caused by being carried into the crotches or cracks in the bark by the grain thrips. It is believed this can be prevented by painting the spots with some asphaltum paint to prevent the entrance of the thrips.

In Josephine County conditions as to blight were more or less like Jackson County, though not quite so severe. However, practically the entire crop of Winter Nellis pears was lost by blossom blight.

Strange as it may seem, we have not yet been able to find a case of fire blight in Douglas County, though it certainly exists both north and south of it. Scab, scale and anthracnose however are present in all three counties.

Fire blight is prevalent in the Summer Lake and Lakeview districts in Lake County but there seems to be no effort made to control this disease. In fact, I found no inclination on the part of the growers to do anything to better their orchard conditions in Lake County. There are a number of small orchards around Lakeview and along the shore of Summer Lake, but frost often takes the crops there.

Blight is also common in Klamath County, where also there seems to be no desire to improve the conditions.

A determined effort was put forth in Jackson County in 1916 to get control of the scab and the campaign was very gratifying. In every case where proper spraying methods were used there was no loss from scab worth mentioning, but in many orchards which were not sprayed the entire crop was lost.

The brown rot of the prune has caused enormous losses to the growers in Douglas County, where the prune crop is a very important one. This loss has been estimated to have run as high as fifty per cent for the year 1915. Work was begun to have the growers spray their orchards scientifically and arrangements were made with the Oregon Agricultural College for demonstrations of brown rot spraying. These demonstrations were carried out by Prof. W. S. Brown with the assistance of County Fruit Inspector Fred L. Strang. The results were highly satisfactory and gave a valuable object lesson to the prune growers. If proper spraying methods are used and a thorough cleanup of old "mummied" prunes made there should be no great difficulty found in controlling this disease.

Scale is found in all three counties but is easly controlled and occasions no loss on sprayed orchards.

"Winter injury" or "sour sap," has been worse in 1916 than for several years past. A great number of trees have been injured and many killed by this condition. It has occurred principally on the lighter and shallow soils but it has not been confined to these two types.

Mildew has been severe in some places but in these cases no efforts had been made to control it.

Codling moth caused considerable loss in certain orchards owing to the fact that these growers, who had not fired to prevent frost

injury, were in doubt as to whether they had sufficient crop left after the frosts to warrant spraying. In some cases some of the fruit recovered from the freeze and the orchard was then sprayed for the moth, but it was too late and most of the apples were infested.

Fruit Prices, Etc.

The prices for all varieties of fruit for the season of 1916 up to December 1 have been generally satisfactory. Some very high prices were received and, on the whole, the market condition has been better than for the year of 1915.

At the present time all fruit trees appear to be well set with fruit buds and under normal conditions there should be a large crop for 1917. However, this prediction is based only on the presence of healthy looking fruit buds.

Sugarbeets

During the year 1916 a large sugar plant was constructed at Grants Pass, the cost of which is given as one million dollars. Previous to its construction a campaign for acreage was actively pushed and many merchants and citizens gave of their time and money to secure contracts guaranteeing a big tonnage of beets. It was understood by many, if not all, in the Medford district, that if they secured the largest amount of acreage the plant would be constructed between Gold Hill and Ashland. This was the incentive that caused such a determined campaign of the Medford Commercial Club, backed by the business men and people generally. When it was announced that the factory would go to Grants Pass a large acreage in the Medford section was repudiated by the growers and many contracts which could have been secured were not available. This condition was lamentable but is mentioned partly to explain the shortage of beets and the unsatisfactory first year's run at the factory.

Another factor which contributed largely to the shortage of beets was the failure of one of the irrigation companies to furnish sufficient irrigation around Grants Pass. Many acres of sugarbeets were planted near Grants Pass which were a total loss on account of the failure of this irrigation company to furnish the promised water. However it is hoped that conditions will be changed next season and a determined effort is now being made by the company to get contracts sufficient to insure a big output of sugar next season.

The total amount of beets turned over to the company was 7,500 tons which produced 15,000 bags of sugar. The company is now trying to secure acreage for at least 40,000 tons of beets for the season of 1917. Considerable acreage has already been signed up and it is hoped to secure the above amount without very much trouble.

The question as to whether those who did raise good beets found it profitable was answered by a member of the sugar company who stated that these growers had already renewed their contracts. It seems that where the beets were grown on good soil and with irrigation the crops turned out well. The sugar content was good, averaging fifteen per cent.

The factory was able to run only two weeks with the tonnage secured. During the run they had about 150 employes.

With the establishing of the sugar plant the question naturally arose among the people in southern Oregon as to the effect on the price of sugar. Investigation shows that the sugar is sold through a distributer who, it is said, regulates the price. At any rate, the price is exactly the same as it is in San Francisco plus the freight. That is, merchants here are required to pay not only the cost of the sugar but also the freight from San Francisco or Portland. It may not be pertinent to comment on this in my report, but I feel that anything which affects the welfare of the growers is a proper subject to consider. If allowance was made for freight, as seems fair and just, the cost to the merchant and so to the consumer should be the market price at San Francisco, which I understand is the basis used for price. The addition of the freight charge is merely an added profit and would make a difference at Medford of about sixty-one cents per hundred.

Vegetables and Small Fruits

There is a large variety of vegetables and small fruits raised and sold throughout the third district. There are several canneries in operation which are using considerable quantities of berries and vegetables. This is proving a welcome outlet for a large quantity of such produce. Some of these canneries have come into existence within the past two years and are making a success of the business.

Besides the canneries there are considerable quantities of dried fruits being put out. This is especially so in Douglas County, where the prune crop has been making money for the growers.

Douglas County is now putting out a fine quality of broccoli which has been making good returns to the growers and bids fair to be a big industry there.

County Organization

Owing to the importance of the fruit industry in Jackson County there is maintained a pathologist's and fruit inspection office which is probably one of the best organizations of its kind in the country. Mr. C. C. Cate is county pathologist, with C. A. Noren as entomologist and assistant, and four fruit inspectors. The office is well equipped with the very best apparatus and equipment for scientific work and has an extensive library.

The work of the office has been very thorough and much has been accomplished. Mr. Cate has made extensive experiments of many kinds and has been able to do a great amount of excellent work. In this he has the hearty support of the growers and every one concerned. He has been at work upon a series of experiments on the sugar and starch content of apples and pears which it is hoped will give the growers an exact method of determining the right time to pick their fruit. A great deal of fruit is always picked too ripe or too green, with consequent losses. The method upon which he is working gives promise of solving this hitherto vexing question. This is only one of the many important questions which he is endeavoring to solve.

Mr. Noren, the entomologist, has made a large collection of insects of the county, which he has mounted and classified. These make a valuable addition to the laboratory and his work has materially aided in the studies of insects in relation to the spread of certain diseases.

The fruit inspectors have all proven themselves loyal and hard working and have given efficient service and material assistance in all experiments, etc.

Near Talent, in Jackson County, is located the Agricultural Experiment Station under Prof. F. C. Reimer. This institution is doing valuable work which will benefit not only Jackson County but the State at large. Prof. Reimer has made some very impressing experiments in fertilizers and also is engaged in propagating blight-resistant trees.

Besides this, Jackson County has not been slow to call upon the Oregon Agricultural College and has greatly benefited by its work as has every section in my district. It is to be hoped that every effort will be made to further aid both the College and the experiment stations to the end that their work may be continued and on a far greater scale.

In Josephine County Mr. C. D. Thompson has succeeded the fruit inspector, and as county agent and deputy horticultural commissioner, is handling both the advisory and inspection work. Mr. Thompson has been in the county less than a year, but he has been very active. He has been in close touch with the growers of fruit and the farmers and has helped them in many ways. He has made a number of demonstrations and experiments of much value and has outlined a great deal of work for the future.

He has held many meetings about the county and assisted in organization, besides doing the inspection work and enforcing orchard cleanups.

In Douglas County Fred L. Strang holds the office of inspector. He has been diligent in his work and has accomplished much both in an advisory way and as inspector. The county is a very large one and the orchards are widely scattered. It is a difficult task for one man to handle so much territory and it is to be hoped that Douglas County will soon get a county advisor to aid in the work of education and the betterment of farm and orchard management. Mr. Strang has had some aid from the Extension Service of the Oregon Agricultural College and with this and the cooperation of the growers has accomplished much.

Lake County has no fruit inspector at present, but I have deputized Mr. O. B. Hardy county agent there, to inspect shipments of imported potatoes.

Mr. O. I. Gregg has been appointed fruit inspector of Klamath County, but his labors are limited almost entirely to the inspection of potato shipments. Klamath County also has a county agent.

ALBERT C. ALLEN,
Commissioner for Third District.

Medford, Oregon, December 30, 1916.

Report of C. A. Macrum, Commissioner for Second District

To the Honorable State Board of Horticulture:

The one great problem holding the attention of the fruit growers in the past three years has been the proper and profitable marketing

of his product. The outbreaking of the great European war in August, 1914, following a six-year period of booming in the planting of orchards, spelled disaster for many.

The fruit business is today much in the condition of a man with locomotor ataxia; the lack of coordination is resulting in a waste of energy which, if properly coordinated, would result in accomplishing much.

Each fruit section, suffering from the depression of its business, attempted its own cure by means seemingly suited to its necessities and without any lasting benefit. The first attempt at a united effort resulted in a call for a convention of growers at Seattle in January, 1915. Out of this effort grew the Growers' Council, which ceased to exist from lack of support from within and a few other reasons. However, one good resulted from this move—a better understanding between the selling agencies—which operated to the benefit of the grower.

During the present year the Federal Government, recognizing the conditions in the northwestern fruit-growing states, through the Bureau of Markets, has organized The Fruit Growers' Agency. The officers and trustees are composed of men from the four northwestern states, representing both the growing and selling ends of the business. This organization, in the opinion of the writer, is the first really constructive effort made on behalf of the fruit industry; but to prove a success and accomplish what its originators hope for, it must have the coordinated support of every local cooperative unit.

People who live on the land lead an independent and more or less isolated life. Through lack of opportunity to associate with others, they live largely with their own thoughts, thus establishing an introspective habit of mind, which leads to suspicion of others and their motives. This is the psychological reason for the disinclination of the average farmer or fruit grower to cooperate and form local organizations for his own benefit and protection. And, paradoxical as it may seem, he is the one most likely to be "stung" by the unscrupulous or designing. Knowing the fact that all lines of business with which he has dealings is organized against him does not bring him to realize the necessity of organization and cooperation of himself and his neighbors.

The basic necessity of fruit growing today is the local organization. This can only be brought about by a continuous effort to educate the individual grower to cooperate and stay "cooperated." Once every district is organized and controls its output, the supervision of distribution is relatively an easy matter. C. A. MACRUM,

Commissioner, Fourth District.

Mosier, Oregon, December 30, 1916.

Report of H. H. Weatherspoon, Commissioner for Fifth District

To the Honorable State Board of Horticulture:

Below you will find a brief summary of work done by myself as Horticultural Commissioner for the Fifth District for the years 1915-16, also a brief reference to packing, grading and marketing

apples and extension of the apple trade in the rural communities, observations on the latter subject having been made and taken by actual work in the field of markets at my own expense and time.

Commencing with the year 1915, it was found that the most serious problem we had to meet was fighting what is commonly known as fire blight, which up to that year made serious inroads of damage to nearly all the orchards in the fifth district.

Prior to 1915 a great many growers could not be convinced that blight was actually a disease and one that would keep spreading if no effort was made to check same, hence no concerted action could be had among the growers, which action was necessary for elimination of the disease. Commencing with the early spring pruning of 1915, a vigorous campaign was launched for the purpose of eliminating as far as possible the disease in all the larger apple growing sections. Eighteen meetings were held in various sections and approximately 2,500 growers were instructed in the matter of taking care of blight. County inspectors were instructed thoroughly that in the case of people who were not disposed to take care of their orchards in the matter of blight, they should take care of the same for them, according to law. In a general way a wave of enthusiasm or determination was created and the year's work proved to be a very successful one as damage by the disease was decreased approximately seventy-five per cent and in the orchard section of the Grande Ronde Valley the disease was almost entirely exterminated.

Commencing with the year 1916 a vigorous campaign was kept up in Umatilla, Baker and Malheur counties where more or less hold-over blight was observed; also careful watch kept on other districts and with the close of the year, I am pleased to advise you that with only a reasonable amount of vigilance on the part of county inspectors and owners the blight will no longer be a matter of any consequence.

During the year 1915-16 meetings were held in various localities with the growers and all manner of insect as well as fungous diseases were discussed for the information and general education of all.

The cost of county work for county inspectors for the two years was approximately as follows:

Umatilla County, two years	$1,400.00
Union County, two years	1,200.00
Baker County, two years	700.00
Malheur County, two years	1,900.00
Wallowa County, two years	350.00
Others, none.	

It is to be admitted that it would not be wise to discontinue county inspectors, however the cost of this work can and will be greatly reduced in the future, owing to the fact that owners of orchards who are in the business to stay are alive to their own interests, and now that the various methods of fighting troubles of the orchard are common to nearly all it will not require such a great amount of detail work on the part of county men.

During the past two years no new commercial orchards have been set. During the same period there have been pulled out 2,390 acres of trees from four to six years old and the land is being used for other

purposes. There are in the fifth district approximately 3,500 acres of young orchard neglected beyond recall and 1,700 acres neglected to such a degree that it will be several years before they can be put on a paying basis, if ever. There are in the hands of speculators purely (not orchard men) approximately 8,000 acres which, on account of their financial conditions, show neglect, and it is fair to say that sooner or later at least forty per cent of these will prove a failure.

Observation proves the fact that the orchard business and growing of fruits is a business of its own and those not fully equipped with the necessary experience and knowledge will sooner or later go out of the business, as it is a matter of impossibility for them to make a success.

During the years 1915-16 I have given a great deal of attention to the potato crop and diseases affecting same, as it was becoming apparent that with the continual decrease in yield per acre that was taking place there was a corresponding decrease in acreage planted, as the business was becoming unprofitable to the farmers. Close investigation proved it to be a fact that this decrease in yield was due to the diseased condition of seed and not due to the supposed fact that our lands were becoming depleted in mineral food supply as was supposed. Every assistance and encouragement in my power has been given this line of work, and it is believed at this time that with the work kept up and with proper assistance and encouragement farmers will grow more potatoes the next few years than has been the case in past years. A very large source of income has been cut off in Umatilla, Union, Baker and Malheur counties because of farmers giving up the raising of potatoes to a large degree, but it is to be hoped this condition can be overcome with the proper encouragement.

Markets and Marketing

Each year for the past five years during the fall and winter seasons I have gone into the markets of the middle west with my own product with a view of educating myself as to the best and most feasible way this part of the business could be carried on in order to give the growers a fair return for their product, and also to determine any plan possible that would encourage the consumption of fruit in general.

In summing up the successes and disappointments that I have met during that five years my findings in this matter are as follows:

There has not been and never will be an overproduction of apples, provided we will do our part in the matter of preparation for the markets with a view to a better distribution, thereby creating a greater consumption.

Our present system appears to be too cumbersome and is top-heavy with middlemen. A few middlemen are absolutely necessary but we should limit that few to such a number as are actually necessary to handle the business and no more.

Commission houses doing business only on consignment are a menace to the business and have done more to demoralize the markets than any one thing we have had to contend with.

Eastern cold storage plants, next to the commission men, have played their part well in clipping off the profits of the growers as well as in keeping the markets in a demoralized condition.

Every section should have its own home storage ample to store every box produced and the stock should be packed for shipping only as it is called for and no shipments should move except on bona fide orders. In case of turn-downs by unscrupulous dealers, the stock should then and there be sold to best advantage and not run into cold storage as these concerns are used largely by buyers to hammer down the price of what you have at home. Cold storage concerns are in the habit of offering advances to growers until their stock is actually sold in order to fill their houses early in the season, and in the past growers have "fallen" for this and the result has been in probably seventy-five per cent of cases a great loss on cars stored in this way, and a still greater loss on the stuff left at home, as buyers are always ready to point to the fact of how many thousands of boxes are in cold storage that they can buy cheaper than you are offering your remaining stock at home.

What has been in the past termed an overproduction has not in reality been such, but our system of marketing has created an underconsumption due to lack of proper distribution at a price that the masses could afford to use the fruit. Our markets can rightfully be placed in two classes: one is the city markets; the other the small town or rural markets. At the present time the city markets use approximately seventy-five per cent of the entire production of fruits due to a better distribution, while as a matter of fact if conditions were righted, quite the reverse would be the proper condition. If we succeed in perfecting a system that will make our distribution as good as that of the larger cities, then we will have created a consumption equal to or even greater than that of the city trade which means that our products would be in a very great demand and become the world over a household necessity instead of a luxury as is the case at present.

The city trade requires largely what we call an extra fancy article dressed up in the very finest shape to create appearance. This is because the trade is largely a five- and ten-cent trade the same as oranges and the high cost of this preparation falls heavily on no one as box lot sales to the consumer are not a common occurrence, as is the case with the population of the rural districts.

The rural trade demands an article of standard quality packed in a sane and safe way that it may not be injured, and placed on the market at prices that will enable them to buy at a price in keeping with other food products necessary. When this condition is met properly, all the fruiting trees growing in the United States, were they to bear regularly every year, will not any more than fill the demand.

To meet these conditions, it is up to the grower to keep cost of production down to a minimum, to know the markets he intends to market in, in order that he may know just how much expense of preparation he can use in order to make his product popular to the extent that it will create a demand and out of all this be able to place his product up to the cosumers at a price they can afford to use same and give him a fair return for his efforts.

A careful accounting was kept during 1916 on one eight-year-old orchard showing the cost of production from a labor standpoint up to picking time to be as follows:

Cost of one light pruning; one calyx spray; plowing of land and three diskings and three harrowings, per box	3½ cents
Adding to this the cost of picking, per box	3½ cents
Cost of picking up boxes and hauling to storage, per box	2½ cents
Total	10 cents

Now that the article had been produced the market preparation commenced as follows:

Box	12 cents
Grading	5 cents
Packing, wrap-pack	5 cents
Lining and wrapping paper	4½ cents
Storage	5 cents
Lidding and marking	2½ cents
Loading on cars and necessary packing	2 cents
Total	36 cents

From the above figures it is to be seen in this case we produced and harvested into storage an article for ten cents per box and the after preparation under the regulations cost nearly 300 per cent more than that of growing, not counting the amount of interest on the original investment.

As a business proposition we add to the above costs a fair amount to cover interest on the investment and a sufficient amount over all to give us a fair return of profit for our work, adding to this association cost of handling, broker's profits, wholesaler's profits, traveling men's expenses and retailer's profits, and finally the cost to consumer is out of all proportion to what it should be, considering it cost so little to bring to maturity.

The city trade, as I have said, demands the finest article that can be produced, dressed up in its finest and are willing to pay the price.

The rural trade is willing to take a good article at a fair price and is willing to leave the matter of appearance out of consideration, so long as quality is not affected.

Country consumers prefer an unwrapped apple and also prefer to have mixed sizes in the boxes as they are usually bought in quantities and used as a common food in the family when prices are right.

Country merchants for the above reason prefer for this trade apples prepared for sale in this way.

Since the above is a condition that actually exists it is up to the growers to prepare and market their apples in a way that the consumers want them rather than in a manner most pleasing to themselves; therefore it may be seen that by careful preparation and strict economy we can place on the market especially for the rural trade our apples at considerably less first cost to ourselves and eventually to the consumers by a more direct route at a much less price than it is being done and yet have just as much profit with much less money invested. This refers particularly to the fancy and C grades.

As for the extra fancy, there appears to be nothing left to do, as the public that uses this grade is willing to pay the price, but the lameness of our entire system is in the fact that our method requires

as much preparation cost for the fancy and C grade as it does in the extra fancy, and the price we get for the two lower grades will not warrant us in keeping same up.

In conclusion, I wish to say it is a case of every grower keeping down the cost of production to the limit, practicing every economy necessary in cost of preparation for the market that will not lower the quality of the fruit, knowing his markets and what it is going to cost to market, and allow him a fair return, and it is my belief under this system that we will create prices equitable for all and thereby create a consumption that will be satisfactory and lasting.

H. H. WEATHERSPOON,
Horticultural Commissioner, Fifth District of Oregon.

Elgin, Oregon, December 30, 1916.

Report of J. E. Stansbery, State Inspector

To the Honorable State Board of Horticulture:

I respectfully present the following summary of the more important work done by me during the biennial term ending December 31, 1916:

In the calendar year 1915, I inspected 499,359 trees, shrubs and plants imported from foreign countries, the greater part coming from France, Belgium, Holland and Japan. I also inspected 129,300 pounds of bulbs imported from foreign countries. On account of the danger of the introduction of the potato tuber moth into this State from California, it was necessary to inspect with great care all potatoes imported from that state. During the year I inspected 18,863 sacks and boxes of potatoes imported from California. I found 288 boxes and sacks infested with the potato tuber moth worm and these were burned or sent back to California. I have kept no record of the number of trees and of the quantity of fruit and vegetables coming into the State from other states which have been inspected. During the year 1915, the number of trips I made in response to notifications to freight depots, steamer docks, express offices and nurseries was 689.

The European war caused a great reduction in the number of trees imported from foreign countries in the calendar year 1916. During this year I have inspected 765 cases of trees and shrubs coming from foreign countries, aggregating 99,268. Of these 427 cases came from Holland, 256 cases from Japan and eighty-two cases from France. During the year 1916 I inspected 135,573 pounds of bulbs imported from foreign countries and 4,369 pounds brought into Oregon from other states. I inspected during the year 1916, 20,018 sacks and boxes of potatoes from California, and 336 boxes and cases were found infested with the potato tuber moth worm and were sent back to California. During the year 1916 I made 721 trips to freight depots, steamer docks and express offices to make inspections in response to notifications. I have also made a great number of visits to nurseries and greenhouses for inspection purposes, and have inspected many small shipments of trees and plants for persons wishing to send them by parcels post.

J. E. STANSBERY,
State Inspector of State Board of Horticulture.

Portland, Oregon, December 30, 1916.

APPENDIX

ORCHARD SPRAYING IN OREGON

(This article is taken wholly from College Bulletin No. 228, of the Oregon Agricultural College, prepared by Prof. H. P. Barss, Botanist and Plant Pathologist of the Oregon Experiment Station, and Prof. A. L. Lovett, Acting Entomologist of the Oregon Experiment Station.)

APPLES

The Young Orchard, if clean of disease and insects when planted, seldom requires any regular schedule of sprays. Thorough inspection should be made in the early spring, in the early summer, and in the fall, for possible troubles. Inspect the trees carefully for apple mildew, appletree anthracnose, San Jose and oyster-shell scale; examine for woolly aphis and borers, and look frequently during the growing season for bud weevils, aphis, tent caterpillars, etc. San Jose scale and woolly aphis particularly should not be neglected. When any of the troubles are present, follow out the spray schedule as outlined below to cover the particular case.

The Bearing Orchard. With few exceptions a regular spraying program should be adopted. The two worst fruit pests, apple scab and codling moth, are present in practically every well-established orchard district in the State. Frequent inspection should be made for other insects and plant diseases, which if allowed to go unchecked, are liable to establish themselves and cause considerable loss in the orchard.

Winter Treatment. For powdery mildew, prune out as many of the mildewed twigs of the previous season as possible. For apple and pear scab, plow the fallen leaves under before the winter buds open, at any time consistent with soil conditions and the general orchard practice being followed.

For fire blight (see under "Pears") go over the orchard and remove and sterilize all hold-over cankers. If hold-over cankers are thoroughly eradicated from an orchard, the grower can hold the disease in check to an extent otherwise impossible. Look for collar and root rot due to blight and cut out and sterilize. If fire blight is present in the orchard, it is necessary to sterilize the pruning instruments used in the regular pruning, since wide dissemination of blight can take place in an orchard through failure to sterilize the pruning instruments after they have been used on infected fruit trees.

1. **Dormant Spray.** To be applied while the winter buds are swelling just before they open.

For scale insects and red spider mites.

Use lime-sulfur, 1 to 8 (1 gallon lime-sulfur to 8 gallons water) or miscible oil emulsion, 1 to 17.

Leaf Rollers. Where the leaf-roller or green fruit-worm is present it is advisable to use the miscible oil emulsion. Spray in the spring at the time indicated above. This oil spray will control scale, red spider and aphis.

2. **Delayed Dormant Spray.** To be applied a short time after the winter buds have burst. In the case of apples, when the leaves are about half an inch long.

For plant lice (aphides), red spider mite, and bud moth.

Use lime-sulfur 1 to 18 or 20, plus nicotine sulphate 40%, 1 to 1200 (1 pint to 150 gallons) plus arsenate of lead 4 to 100 (4 lbs. to 100 gallons of dilute spray solution.)

The first spray for apple scab and often very important. Probably helpful in mildew control.

If plant lice and red spider are absent, omit the nicotine.

If bud moth is not serious, omit the arsenate of lead.

Injury. When used in the strength indicated, lime-sulfur is likely to burn the tips of the young leaves, etc., but experience has shown that this generally results in no particular harm. This application is usually very necessary.

3. **"Pink" Spray.** To be applied just before the petals open.

For scab, second spray; also for bud moth, leaf-roller, leaf-eating caterpillars.

Use lime-sulfur 1 to 25 or 30, plus arsenate of lead 4 to 100.

Where the insects mentioned above are not serious, omit the arsenate.

Cover all parts thoroughly, but aim not to drench.

4. **"Calyx" Spray.** To be applied just as the last petals are falling and before the calyx lobes close.

First codling moth and third scab spray.

Use lime-sulfur 1 to 35 or 40, plus arsenate of lead 4 to 100.

Where lime-sulfur injury is likely to occur in later sprays, add four pounds of atomic sulfur to each 100 gallons of lime-sulfur spray at this time to prepare the trees for the use of atomic sulfur alone later on..

5. **"Ten Day" Spray.** To be applied ten days or two weeks after the preceding.

For apple scab.

Use lime-sulfur 1 to 40 (or atomic sulfur 12 to 100.)

It is not safe to omit this application, as new foliage and fruit surface is rapidly developing.

Injury. Under certain conditions lime-sulfur injury is likely to occur. If indications point to very warm weather atomic sulfur 12 lbs. to 100 gals. might be used as a substitute.

Use only a fine mist spray at this time and cover all surfaces evenly. Where leaf-eating insects are present, add lead arsenate as above.

6. **The "4 to 5 Weeks" Spray.** To be applied 4 to 5 weeks after the calyx spray.

Use lime-sulfur 1 to 40, or Bordeaux 4-4-50, or atomic sulfur 12 to 100, plus arsenate of lead 4 to 100.

When moist weather occurs late in the spring this spray is required for the control of apple scab. Where lime-sulfur at this time is likely to cause injury, a substitute is desirable. Atomic sulfur may be used provided some of this material has been used on the trees earlier. Otherwise, it is likely to cause defoliation. If the down or fuzz has disappeared from the fruit, the Bordeaux at this time is not likely to injure.

The exact date for the application of this spray will vary with the season and with the locality. Approximate dates are the best we can submit. The date should correspond with the first deposition of eggs by the codling moth. Procure a standard thermometer, and take daily readings at 8 p. m. When the evening temperature registers 60 degrees or above it is time to apply this spray. As a general rule this date will follow the calyx spray by about 3½ to 4½ weeks in Eastern and Southern Oregon; 4 to 5 weeks in the Hood River Valley, and 5 to 6 weeks in the Willamette Valley. In a bearing orchard, it is never advisable to omit this application for the moth.

7. **The July Spray.** To be applied July 10 to 25.

For the second generation of the codling moth. It is this brood of worms which produces the costly "September sting."

Use lead arsenate 4 to 100.

In the summer codling moth applications, pay particular attention to the fruit. Use a fine misty spray and cover thoroughly the surface of every apple.

8. **The August Spray.** To be applied August 5 to 20.

For the second generation of the codling moth (also of some value for apple scab and apple-tree anthracnose.)

Use arsenate of lead 4 to 100 (plus Bordeaux mixture 4-4-50 if desired).

It is believed that if Bordeaux mixture is used at this time and the branches and fruit thoroughly coated, some protection will be afforded against the early fall infections of apple scab on the fruit and of apple-tree anthracnose on both the fruit and branches. It would be preferable, however, to spray a few weeks later for these diseases.

9. **Early Fall Spray.** To be applied in early September, before the fall rains.

For apple-tree anthracnose and apple scab.

Use Bordeaux mixture 4-4-50.

10. **Late Fall Spray.** To be applied soon after picking, late October or the first week in November.

For apple-tree anthracnose (and scale, if lime-sulfur is used.)

Use Bordeaux 4-4-50 or lime-sulfur 1 to 8.

The twigs, limbs and trunk should be given a complete and thorough coating.

The Woolly Apple Aphis is a serious orchard pest of both apple and pear. It attacks the tree both above and below ground and where once thoroughly established is a very difficult insect to eradicate. In blight-infested districts it is undoubtedly an active agent in the dissemination of this disease, often carrying the infestation to the roots and crown of the tree. Every woolly-aphis-infested tree should be marked and given individual attention. Use kerosene emulsion 15 per cent solution (see directions further on), applying it freely to the infestation above the ground and to the trunk of the tree. Remove the soil exposing the surface rootlets and saturate with this solution, then re-cover.

Borers seldom attack thrifty vigorous trees. Keep the trees in good condition by care and cultivation. Cut out borers where found and protect the wound with grafting wax or pruning compound. Use repellant wash No. 1 on young trees.

Powdery Mildew of the Apple. This disease is becoming quite serious in some sections of the State. Experiments for its control will be commenced in Oregon during the coming season. Definite recommendations cannot be made at this time, but it is believed that the application of lime-sulfur through the spring or of lime-sulfur first and atomic sulfur later, as suggested above for scab control, will result in material decrease if not complete control of the disease. In California "iron sulfide mixture" is used in the control of mildew alone, with apparently good results.

Fire Blight. This is Oregon's most serious orchard disease. It should be watched for constantly and upon being discovered steps should at once be taken to eradicate it from the neighborhood as well as from the orchard where found. Notify the fruit inspector and get his assistance. For a discussion of the disease see under "Pears."

PEARS

In general, the same recommendations for the application of sprays as given for the apple will apply for the pear.

Blister Mite. On pear varieties which permit the practice, use lime-sulfur 1 to 12 as the tips of the leaves are emerging. For varieties where the fruit buds open with or before the leaf buds, apply the solution shortly before the blossoms open, and dilute the lime-sulfur 1 to 15.

Codling Moth. The calyx application of arsenate of lead is not necessary for the codling moth.

Pear Slug. In the "10-day" spray (No. 5 under "Apples") add lead arsenate 4 to 100 for the first brood. The regular summer application (late July or early August) for the control of codling moth will usually control the second brood of slug.

Pear Scab. Control as for apple scab. Give the first application in the "delayed-dormant" condition before the cluster of blossom buds has pushed out to any considerable extent. In this application use lime-sulfur 1 to 15, where blister mite is present. In later applications use a little weaker solution than recommended for apples.

Fire Blight (Pear Blight.) Watch for fire blight. There are few parts of Oregon that have not been invaded by this disease. If not detected in its first attacks in an orchard and promptly eradicated, the disease increases rapidly and it becomes a matter of great expense and difficulty to overcome it. Wherever it is discovered, the fight against it should become a community matter, since its presence in one orchard is a menace to all the orchards of the community. In those sections of Oregon where the disease is being successfully held in check, the fight has been made a distinctly community fight and funds have been provided for the careful and thorough inspection of the orchards throughout the district and for the enforcement of the eradication measures necessary for the control of the disease. Where this has not been done, the disease has swept in, resulting in tremendous damage to both pear and apple orchards.

If any grower discovers a diseased condition that he suspects may be fire blight, he should send a fresh specimen at once to the Agricultural College or to his local fruit inspector for identification. In this way steps may at once be taken, if it prove to be fire blight, to locate the source from which it entered the orchard, and by the adoption of proper methods, to eradicate the disease from the grower's own place and from the entire neighborhood. No one should try to eradicate the disease himself until he finds out from a reliable source just how to do it. Because of the extremely contagious nature of the disease, ignorant efforts can easily result in spreading it instead of checking it.

Fire blight is caused by bacteria of a particular kind. It may be recognized in general by the wilting and dying of blossoms, spurs, twigs, and branches. The dead foliage clings to the twigs, turning black in the case of the pear, brownish in the apple. The bark invaded by the bacteria also turns dark colored. When the disease is very active, bacteria ooze out of the affected parts in pearly drops that contain millions of individuals. This ooze is attractive to insects, which become contaminated with the germs and easily spread disease. The exudition also may be washed by rains or spattered onto foliage and green shoots and start new infections in this way.

The disease is carried over the winter in the margins of dead areas known as hold-over cankers. In the early spring the bacteria become

active in these cankers. From these sources fire blight is carried by insects, birds, etc., to the blossoms or other healthy parts, thus producing new infections that develop rapidly. The disease is often spread by unsterilized pruning tools. Any part of the tree may be attacked. It usually begins in the spring as a blossom blight. Later twig blight and blight cankers make their appearance. Water sprouts are very susceptible and the blight makes its way rapidly down such shoots to the trunk or roots where body blight, collar rot, and root blight may develop with the most serious consequences.

The season of the most rapid development of fire blight corresponds with the season of most active growth of the tree, and warm, moist conditions which accelerate tree growth also favor the increase of the disease. In general, the healthiest and most vigorous trees suffer the most severe effects. In addition to the apple and pear, quinces are very susceptible. Native pomaceous trees such as wild crab, hawthorne and service berry are also attacked.

Control. The only successful method of fighting fire blight, whether in a single orchard or in an entire community, is by removing the diseased parts or tissues from affected trees as rapidly as infections are discovered, and by cutting out all hold-over cankers. In the fall and winter the trees should be gone over and inspected, branch by branch and limb by limb and all dead parts cut out and the wounds sterilized. The eradication of hold-overs is of tremendous importance and where thoroughly done is of immense benefit. Later, as the disease makes its appearance during the growing season, active efforts should be taken to detect and eradicate every new case. In cutting during the most active period, the bark should be removed or the branch cut back from one to two feet below the point of lowest evident discoloration. If the outbreak is serious, such methods should be adopted in the orchard as will check the growth of the trees and thus tend to check the rapidity of the advance of the disease.

All wounds should be sterilized with a 1 to 1000 solution of corrosive sublimate (bichloride of mercury.) This material can be secured at any drug store with directions for preparing the proper strength. It will attack metals and therefore should be kept in clean wooden or glass containers only. The meaterial is deadly poison and should be so labeled. Keep a sponge or cloth soaked in the solution and wash the surface of every wound. The cutting and pruning instruments ought to be disinfected after each cut. Do not use the solution after it has become dirty, and keep the sponge freshly wet while is is being used. Brush and bark removed from trees should be burned at once and not left on the ground to attract insects.

Growers who are expecting to plant pears in the future will do well to secure information in regard to the fire blight resistant pear stocks which have been under investigation by Prof. F. C. Reimer of the Southern Oregon Experiment Station, at Talent, Oregon. Professor Reimer has made some very important and very encouraging discoveries in this connection which will be of immense value to the future pear industry. Inquiries may be addressed to Professor Reimer himself or to the Oregon Agricultural College at Corvallis.

PEACHES.

1. **The Dormant Spray.** To be applied at least one or two weeks before the buds begin to open. (February for most parts of Oregon).

For peach leaf curl and San Jose scale.

Use lime-sulfur 1 to 8. If no scale is present Bordeaux 6-6-50 will be effective.

Infections of peach leaf curl take place just as the leaves are emerging. A single spray will control the disease if applied before the buds begin to come out. To be effective the fungicide must cover every bud.

2. **Late Dormant Spray.** To be applied just as the first buds begin to open in the spring.

For peach-twig miner, aphis, red spider mite.

Use lime-sulfur 1 to 12, plus nicotine sulfate (40%) 1 to 1200, (one pint to 150 gallons). Add arsenate of lead 3 to 100, (3 pounds paste to 100 gallons of dilute solution) if the bud moth is present.

If aphis and red spider are not present omit the nicotine sulfate. This spray will probably be of some value for the control of powdery mildew and to some extent possibly for brown rot, but will usually be too late for peach leaf curl.

3. **To be Applied When the "Shucks" or Flower Parts Fall Off.** For peach blight, fruit spot and shot hole, for powdery mildew and brown rot.

Use self-boiled lime-sulfur 8-8-50.

Failure to control spring infections of peach blight is due largely to beginning too late. This is a very important application.

4. **To Be Applied Two Weeks Later.**

For peach blight, fruit spot and shot hole, brown rot, and mildew.

Use self-boiled lime-sulfur 8-8-50.

To protect the newly developing surfaces of the fruits, foliage and shoots against infection. Spray thoroughly. If season is rainy another application two or three weeks later would be beneficial.

5. **To Be Applied One Month Before Picking Fruit.**

For peach brown rot, mildew, bud moth and peach twig miner.

Use self-boiled lime-sulfur 8-8-50, plus lead arsenate 3 to 100.

As the fruit matures the danger of brown rot increases. This application is aimed to cover, thoroughly, all parts of the fruit for the last time before picking. This will also help to control peach blight in late varieties.

In Eastern Oregon the peach twig miner frequently attacks the nearly mature fruit causing it to bleed or gum profusely. This summer fruit injury appears to be confined to the eastern section of the State. The arsenate may therefore be omitted in Western Oregon unless the bud moth is serious.

6. **To Be Applied as Soon as the Fruit is Picked.**

For peach blight.

Use Bordeaux mixture 4-4-50.

This spray is designed to protect the branches and buds from the first infections of the peach blight that occur as soon as the fall rains start. Cover all branches and buds thoroughly.

7. **To Be Applied About November First.**

For peach blight.

Use Bordeaux mixture 6-6-50.

This spray is given to insure adequate protection against the blight fungus through the late fall and early winter rains. It is the opinion of the plant pathologist that if the two fall sprayings were thorougly applied in the manner recommended above, there would be little need of spring spraying for fruit spot and shot hole.

Peach Root Borers. On young trees use repellant wash No. 1. For older trees cut out borers and use paving asphaltum, grades "C" or "D." Write to Experiment Station, Corvallis, Oregon, for directions.

PRUNES AND PLUMS

1. **Winter Treatment.** To be applied just as the winter buds are opening.

For San Jose scale, red spider mite, twig miner, and aphis (for brown rot see below).

Use lime sulfur 1 to 8, plus nicotine sulfate (40%) 1 to 1200 (one pint to 150 gallons).

If aphis and red spider are not present, omit nicotine.

This application will not be effective for the control of brown rot. During the late winter, however, all dead twigs and branches and all mummied fruits should be removed from the trees and burned to prevent infection from these sources when the buds come out. In the regular pruning work aim to let in plenty of light and air to the interior of the trees.

2. **To Be Applied Just Before the Blossoms Open.**

For brown rot, blossom and twig blight, and bud moth.

Use Bordeaux mixture 4-4-50 or lime sulfur 1 to 30, plus arsenate of lead 3 to 100.

3. **To Be Applied Ten Days or Two Weeks After the Petals Fall.**

For brown rot and Coccomyces (Cylindrosporium) leaf spot or shot hole.

Use Bordeaux 4-4-50 or lime-sulfur 1 to 50.

A previous application for brown rot just after the petals drop would be of benefit, but for the sake of economy is not insisted upon. The use of a sticker with the Bordeaux would be desirable.

4. **To Be Applied Two or Three Weeks After the Preceding.**

For leaf spot and brown rot.

Use Bordeaux 4-4-50, or lime-sulfur 1 to 50 or self boiled lime-sulfur 8-8-50.

Drenching should be avoided but all parts, upper and lower, of foliage and fruit should be covered with a fine mist. Use a sticker with Bordeaux.

5. **To Be Applied One Month Before Picking.**

For brown rot (bud moth).

Use Bordeaux 4-4-50 with sticker.

(Omit sticker and add arsenate of lead 3 to 100 if bud moth is serious.)

This is the most important application of all for the control of the brown rot as it is designed to protect the fruit against the infections that usually occur in their most serious abundance as the fall rains come on and the fruit ripens. If any sprays have to be omitted do not omit this one. Use a fine mist with high pressure, and get a coating on all sides of the fruit. (To secure thorough protection against brown rot the trees ought to be sprayed about once a month through the summer, but it is not believed that the value of these extra summer applications has been sufficiently demonstrated under average Oregon conditions to warrant their general adoption at this time).

Brown Rot. Since the rotted prunes are a source of infection, some means for destroying them as rapidly as they fall should be employed. Not only do the infected prunes immediately produce a crop of spores able to infect still healthy fruit, but if not destroyed they will be able to discharge a new crop of spores from the buried or half buried mummies the second spring following. To allow them to stay on the ground is to make satisfactory arrangements for a

future abundant infection. The only practical method that has been adopted in Oregon is that of allowing the hogs to run in the orchard and clean up the rotting fruit. A half dozen animals in a large orchard, however, will soon become glutted with the fruits and will not devour the flesh, which is the part that carries the fungus. Enough hogs must be provided to clean up flesh and all.

Bud Weevil. Often attack young trees, particularly when near uncleared areas. They sometimes do serious injury to grafts that are just starting well. Jar insects from tree and apply belt of tanglefoot around trunk about 15 inches above surface of soil.

Root Borer. See under "Peach."

Internal Browning. In many prune-growing sections of Oregon in certain seasons there occurs a great deal of injury to the fruit from the softening and browning of the flesh commencing around the pit and often accompanied by more or less shrinking of the prune. This condition is not caused by the presence of any parasite, is not infectious, and cannot be prevented or controlled by spraying. It is an effect due probably to unfavorable climatic and soil relations as well as to the condition of the trees during the ripening period. No satisfactory control method has been worked out. During the season of 1915 this trouble was exceedingly common and serious and was wrongly called "brown rot" by many growers and shippers, a fact which resulted in confusing this with the fungous disease correctly known as brown rot.

CHERRIES

1. **The Dormant Spray.** To be applied just as the winter buds are opening.

For San Jose scale, aphis, and red spider.

Use lime-sulfur, 1 to 8, plus nicotine sulfate (40%) 1 to 1200 (1 pint to 150 gallons), plus lead arsenate 3 to 100 (3 pounds of paste to 100 gallons of dilute spray solution).

Apply tanglefoot in a band around the trunk to prevent ants from carrying the aphis up the tree.

2. **To Be Applied Just Before the Blossoms Open.**

For brown rot, bud moth and fruit tree leaf syneta.

Use Bordeaux 4-4-50 or lime-sulfur 1 to 30 plus arsenate of lead 3 to 100. Nicotine-sulfate (40%) should be added if aphides are bad.

3. **To Be Applied About Ten Days or Two Weeks After the Petals Fall.**

For brown rot, Coccomyces (Cylindrosporium) leaf spot and cherry slug.

Use Bordeaux 4-4-50 or lime-sulfur 1 to 50, plus lead arsenate 3 to 100.

Where brown rot is bad an additional previous spraying just after the petals fall would doubtless be beneficial.

4. **To Be Applied About Two or Three Weeks After the Preceding.**

For brown rot and leaf spot.

Use Bordeaux 4-4-50 or lime-sulfur 1 to 50.

5. **August Spray.** To be applied about August 1 to 10.

For bud moth and slug where these pests are serious.

Use lead arsenate 3 to 100.

Bacterial Gummosis of Cherry. This disease is common in the Western Oregon cherry growing sections and seriously affects young plantings particularly from their third to sixth or seventh years, but

does not often produce serious results on older trees. All common commercial varieties of sweet cherries are affected to a greater or less extent. The sour cherries and the Duke cherries, however, are affected very little or not at all.

Control. After an orchard is already set out there is nothing that can be done to check the disease except the careful and complete removal of the diseased bark as soon as cankers are discovered. The same methods should be adopted as recommended for fire blight control. The hold-over cankers, however, should all be removed before autumn, if possible in the spring, as there is then a greater chance of rapid healing. The wounds after sterilization should be coated with a good paint to prevent heart rot, and these areas should be repainted as often as necessary to keep a complete protection over the wood.

Prevention. It has been found that practically all so-called Mazzard seedlings are resistant to this disease and it has been proved that to set out Mazzard seedlings, or similar, vigorous, resistant, sweet cherry seedlings, and after two or more years to graft or bud the desired commercial variety onto the limbs is a successful method of avoiding serious consequences from the disease. The danger of girdling trunks and limbs is eliminated and the amount of bacterial gummosis appearing in the tops is much reduced. Among the commercial varieties commonly grown in Oregon, the Lambert is more resistant than the Royal Ann or Bing but it is by no means free from the disease.

Shot Hole Borer. This small borer attacks practically all of our fruit trees. It is particularly serious on the cherry, prune, and peach. The pest never attacks healthy, vigorous trees. Keep trees in vigorous growing condition by proper cultivation and drainage. Where the pest occurs, cut out seriously affected limbs or trees and burn. Paint slightly infested portions with deterrent wash No. 2. Apply in late March and repeat at three-week intervals until the pest is checked.

INSECTICIDES

Materials which kill insects or which deter the insect from attacking plants are termed insecticides. There are two general types of insecticides:

1. **Arsenical poisons,** to be applied to the foliage and fruit. Poisons are for insects which devour foliage or chew their food. Example—caterpillars.

2. **Contact Insecticides** for soft-bodied insects which suck their food through a beak. Insects of this type generally insert the beak inside the tissue of the plant and suck out the juice from within. No poison applied to the exterior of the plant would materially affect them. Contact insecticides, to be effective, must actually wet the insect. Example—plant lice.

ARSENICAL POISONS

Arsenate of lead is the standard arsenical poison spray for the control of insect pests. The majority of the commercial arsenates of lead are good; they conform to the standard as required by law; have a low percentage of water soluble arsenic; and are very satisfactory for all general spray work.

Arsenate of lead is prepared in both the paste form and as a powder. Both are equally effective in the control of insect pests.

The proportions recommended in this bulletin are figured on the basis of the paste form. In case the powdered arsenate of lead is employed use only one-half as much as recommended.

Use. Arsenate of lead may be used alone for the control of leaf-eating insects, codling moth, etc. It may be combined with the following materials and used with reasonable safety on apple foliage; lime-sulfur, Bordeaux or iron sulfide, where it is desirable to combat both a fungous trouble and insects. It may be combined with nicotine sulfate solutions or with kerosene emulsion when it is desired to treat both sucking insects and chewing insects. Combinations of lead arsenate, lime-sulfur or Bordeaux and a nicotine sulfate solution, may be used where desirable.

The combination of lead arsenate and soap; lead arsenate, Bordeaux, and resin sticker; lead arsenate, soap, and lime-sulfur; or lead arsenate, kerosene emulsion, and lime-sulfur, are not advisable on apple foliage, owing to the likelihood of severe foliage injury.

In preparing the arsenate of lead either powder or paste for the spray tank, first make up as a thin paste and add to partly filled tank or place in bowl of strainer and wash into tank with hose, having agitator in motion. The arsenate should never be placed in the spray tank first nor added in the undiluted bulk form.

CONTACT INSECTICIDES

Lime-sulfur is the standard spray for the control of San Jose and oyster shell scale. It also has insecticidal properties when used against the peach-twig miner, and the red spider, or spider mites, and probably to a lesser extent against other scale insects and hatching plant lice.

Commercial Nicotine Sulfate sprays have the advantage of being easily prepared and do not burn foliage. They generally run about 40% nicotine, a concentration which permits of high dilutions. They are very effective against plant lice, etc., at dilutions ranging from one to 1000 and one to 2000. They may be used with fish-oil soap or whale-oil soap and water or with dilute spray solutions of lime-sulfur or Bordeaux. For use with lead arsenate see above.

Miscible Oil Emulsions are commercial preparations in which the emulsifier is incorporated in the oil during the manufacture. They represent our highest type of oil emulsion spray. They have a remarkable power of penetration, tend to spread out evenly over a sprayed surface, and give effective control where an oil spray is desired.

Kerosene Emulsion is usually prepared as a stock solution and then diluted, as used, to the desired strength for spraying.

Whale-oil soap	½ pound
Water	1 gallon
Kerosene	2 gallons

Dissolve the soap in the boiling water. Remove from the fire and add the kerosene, stirring vigorously. The solution must now be agitated until it assumes a thick, creamy, consistency that does not separate on cooling. This condition is most readily brought about by the use of a small bucket pump, forcing the solution through the hose and back into the container.

About a seven per cent solution will serve for most ordinary soft-bodied insects. In some cases a heavier dosage is necessary and in a few cases a weaker dilution is advisable. The following dilutions will probably serve all ordinary purposes. The figures are given on the basis of one gallon of the stock solution.

To obtain four per cent solution, add fifteen and two-thirds gallons of water.

To obtain seven per cent solution, add eight and one-half gallons of water.

To obtain twelve per cent solution, add four and one-half gallons of water.

To obtain fifteen per cent solution, add three and one-half gallons of water.

Kerosene emulsion is particularly effective against the aerial form of the woolly aphis and when properly prepared is a very effective contact isecticide.

Summer applications of oil sprays are best applied on bright sunny days when there is a slight breeze blowing.

For combinations see under "Lead Arsenate" above.

Deterrent Washes:

No. 1. For borers.

Soft soda soap	10 gallons
Crude carbolic acid	1 pint

The soft soap is thinned to the consistency of thick paint by the addition of a strong solution of washing soda. This combination constitutes the soft-soda soap used with the crude carbolic acid.

No. 2. For Shothole borer.

Water	3 gallons
Soft soap	1 gallon
Crude carbolic acid	½ pint

Mix and paint over infested portions of the tree with a brush.

FUNGICIDES

Fungicides are in reality preventives. They cannot cure an injury that is already produced, nor stop the progress on an infection after the fungus has entered the tissues of the plant. Fungicides must be so applied that the tree and its foliage and fruit are protected at the time when infections would naturally take place, and every bit of exposed surface must be covered if perfect protection is to be secured.

BORDEAUX MIXTURE.

This fungicide has been for a long time the most widely used material for controlling fungous diseases of plants. It is now being supplanted to a considerable extent by lime-sulfur and other materials, although for certain diseases Bordeaux is still the most efficient and safest preventive known.

Bordeaux mixture is a combination of copper sulfate (bluestone) and lime. For winter use it is generally made up in what is known as the

6-6-50 Formula

6 lbs. bluestone (copper sulfate)
6 lbs. stone lime (best grade)
50 gallons water

For trees in leaf it is often made up in the

4-4-50 Formula

4 lbs. blue stone (copper sulfate)
4 lbs. stone lime (best grade)
50 gallons water.

Other proportions are also frequently used.

Manufacture. It is of great importance that Bordeaux mixture be properly prepared. It must be made fresh each time it is to be used.

Stock solutions of bluestone alone or of lime alone may be kept almost indefinitely, but the mixed lime and bluestone solutions rapidly deteriorate on standing. The barrels or tanks in which Bordeaux mixture is made up and the container for the stock solution of copper sulfate should always be of wood, since the copper will attack and destroy iron. On this account it is well to have wooden hoops on the barrels. The stone lime used should be of the best quality.

Stock Solutions. If large quantities are used, it is best to prepare stock solutions which contain one or two pounds of the bluestone or lime respectively for each gallon of water. For example, take a fifty-gallon barrel of water and suspend near the top a coarse sack containing fifty pounds of bluestone. After a few hours it will have dissolved. Take also fifty pounds of quicklime and slake carefully with constant stirring and the addition of water as needed to prevent it from becoming dry and "burning." When thoroughly slaked, add water to make up to fifty gallons. These stock solutions then contain each one pound of the original material to one gallon of water. If kept for a long time the stock solutions may lose volume by evaporation. This should be made up with water before using.

Methods. The Bordeaux mixture may be made in a satisfactory manner by several different methods, but the two concentrated solutions should never on any account be mixed together without dilution. The following method will be found to give good results, using the "one-pound-to-the-gallon" stock solutions mentioned above. The quantities given here will make fifty gallons of the common 4-4-50 formula. If a stronger or weaker solution is desired, the quantities of the stock solutions should be increased or decreased to correspond. Larger or smaller amounts may be made up, of course, using the same proportions.

1. Take four gallons of the stock copper-sulfate solution and add twenty-one gallons of water.

2. Stir up the stock solution of milk of lime thoroughly, take four gallons of this and add 21 gallons of water.

3. Pour the two together slowly through strainer into tank or barrel stirring thoroughly or pour one into the other stirring thoroughly.

It is often convenient to prepare the two solutions on an elevated platform and run them simultaneously from the dilution tanks directly into the spray tank.

Cautions. The spray tank or barrel should be rinsed free from all dirt and foreign particles before putting in the spray material; and the spray mixture before going into the spray tank must be strained through a strainer of copper wire, twenty meshes to the inch. This is very important. Always use brass or bronze spray rods or connections, since Bordeaux will attack iron. Always rinse out spray tank, hose, and rod with clean water after using. Before using, test the Bordeaux with red litmus paper secured from the druggist. If the solution is correct, it will have an excess of lime and the litmus paper will turn blue. If it does not turn blue, add more milk of lime to the solution till it gives the right color. The formulae given in this bulletin call for an excess of lime so that there is little danger of excess of copper unless the lime is of very poor quality. Where the lime is insufficient, the uncombined bluestone is injurious to fruit and leaves.

Bordeaux Injury. This material often causes severe russetting of apple fruit, if applied while the fruit is young, particularly when the application is followed by rainy spells. When the fruit and foliage are more mature, it can be safely used in late sprayings. In the early

part of the season, however, lime-sulfur will control fungi with much less danger of injury. Bordeaux is generally considered throughout the country to be very dangerous for stone-fruit foliage. Oregon growers, however, have sometimes used it on peach and prune foliage with no apparent ill effect.

Combination. Bordeaux may be combined without detriment with arsenate of lead and with nicotine sulfate preparations. The spreading and adhesive qualities of the fungicide may be increased by adding some form of soap "sticker," but no soap of any sort can safely be added to a solution containing arsenate of lead.

Resin Fish-Oil Sticker. In spraying fruits and foliage with a very smooth or waxy skin, it is often of great advantage to add some material which will increase the spreading and adhesive qualities of the spray. The following formula will give good results:

Resin	5 pounds
Potash lye	1 pound
Fish oil	1 pint
Water	5 gallons

Place the oil and resin in a large iron kettle and heat until the resin is dissolved. Remove from fire and cool somewhat to prevent sputtering and boiling over when the lye is added. The lye should be dissolved in a little water and the solution added slowly with stirring to the resin-oil mixture. Place again over the fire, add the required amount of water and boil for an hour or more until the sticker will mix perfectly with cold water, forming an amber-colored solution.

Use two pounds with fifty gallons of dilute spray. This sticker cannot be used with ordinary lime-sulfur because of the chemical reaction which takes place. It is used with excellent effect with Bordeaux mixture and would probably be of value when added to self-boiled lime-sulfur or atomic sulfur.

LIME-SULFUR

This mixture has in recent years come to take the place of Bordeaux mixture and other fungicides for the control of many plant diseases. Its effectiveness as an insecticide against San Jose scale gives it an added advantage. It is a combination of lime and sulfur, manufactured in concentrated form, and diluted with water to various strengths for various purposes. Like Bordeaux, this material under certain conditions, has drawbacks which must be taken into consideration.

Commercial Concentrated Lime-Sulfur. This material is now made and sold in large quantities by many reliable firms in this State and elsewhere. The commercial solutions are usually fully equal, if not superior to, the average home made lime-sulfur.

Unless a grower has a large acreage or unless several growers can combine and make lime-sulfur for all at one plant, it is usually more economical to purchase the commercial article. Taking into consideration the cost of materials, equipment, time and labor, it may be said that the cost of making lime-sulfur in small quantities on the farm will generally be considerably greater than the cost of the commercial article at prevailing prices.

How to Make Lime-Sulfur. Lime-sulfur may be prepared by boiling the materials over an open fire, but this method is less satisfactory and uniform in its results than that in which live steam under pressure is used in the boiling process.

Chemist H. V. Tartar, of the Oregon Agricultural Experiment Station, after testing various ways of making this material, recommends

the following method as one which if carefully followed will give a practically uniform product of high quality, testing just about 30° Baume. "Take 110 pounds of good quality stone lime and slake it. Then take 220 pounds of finely ground sulfur, sifted to remove lumps, and mix carefully with a little water until a rather thick, but smooth, paste is secured. Add the sulfur paste to the slaked lime in the vat or cooker. Then add water to make the volume of the mixture 108 gallons. Turn in the steam. Sufficient steam pressure should be provided to bring the material to a boil in about twenty minutes. If much longer is required the condensing steam will dilute the solution too much. To insure complete combination of the sulfur and lime the material should be thoroughly agitated through the whole of the cooking. After it has reached an active boil, allow the mixture to continue boiling vigorously for thirty or thirty-five minutes. Never boil more than thirty-five or forty minutes, as changes begin to occur that will reduce the test of the solution. The solution should be allowed to cool as rapidly as possible. After the sediment is allowed to settle, the supernatant liquid is drawn off. This should give about eighty-five gallons of concentrated lime-sulfur solution testing about 30° Baume. The cooking vat should never be filled more than two-thirds full, since the mixture will seethe up a great deal while the chemical action is going on. In making up lime-sulfur in larger or smaller quantites, the same proportions of lime and sulfur and water should, of course, be used."

Where the cooking is done in a fifty gallon barrel or kettle the formula given below gives about the quantities desirable:

30 pounds good quality stone lime
60 pounds finely ground sulfur
Water sufficient to make 30 gallons

If prepared in kettle with fire beneath, the volume should be increased to about thirty-five gallons at the start to allow for evaporation.

Dilution. The grower who makes his own lime-sulfur should always secure from the druggist a Baume acid scale hydrometer to test his stock solutions. Otherwise he will have no idea as to the correct amount of water to use in diluting for use in spraying. The commercial solutions have the strength marked on the barrel. The following table shows the number of gallons of water to use for the usual winter or dormant strength and for the average summer or foliage strength with each gallon of concentrated lime-sulfur ranging in test from 25° to 35° Baume. Peaches should not be sprayed with lime-sulfur of any strength when leaves are out.

Lime-Sulfur Dilution Table

Hydrometer test of concentrated solution	Number of gallons of water to one gallon of concentrated solution	
	Winter strength	Summer strength
35	9	45
34	8¾	43
33	8¼	41
32	8	40
31	7½	38
30	7¼	36
29	7	35
28	6½	33
27	6¼	32
26	6	30
25	5½	29

The different proportions of lime-sulfur recommended in this bulletin for the various spray dilutions, are based on the use of a concentrated solution testing approximately 32° Baume. If the stock solution tests weaker or stronger than this, the amount of water used to dilute should vary accordingly.

Injury. Lime-sulfur even in very dilute form is liable to injure peach foliage severely. Under certain conditions prune fruit and foliage have also been injured by it. Even apple fruit and foliage often suffer, particularly in the late spring when very hot weather occurs. The reasons for the injury are not clear, but the use of lime-sulfur should, if possible, be avoided for the late apple-scab sprays, especially in sections where spells of extremely hot weather are likely to occur. If the fruit is sufficiently developed, Bordeaux may be substituted and such materials as atomic sulfur may prove to be satisfactory if certain precautions are observed. Self-boiled lime-sulfur also ought to be harmless and of some value as a substitute.

Combinations. Lime-sulfur may be combined without detriment with nicotine-sulfate preparations to control plant lice and with arsenate of lead for codling moth and foliage-eating insects, or with both nicotine and arsenate together. It cannot be used safely with a soap or resin sticker.

Self-boiled Lime-Sulfur

This material was devised as a substitute for the ordinary fungicides, which, if used on peaches and other stone fruits in foliage, are likely to cause serious injury. It has been used successfully for the control of brown rot and other diseases of stone fruits without injury. It is a mixture of sulfur and lime with but very little chemical action occurring during its preparation. The formula most commonly recommended is the

8-8-50 Formula

8 pounds stone lime (best quality)
8 pounds sulfur (finely ground)
50 gallons water

Manufacture. It is most satisfactory to make up three or four times the formula at one time. Actively slaking quick lime should be used if possible.

1. Place the lime in a barrel and add enough water to start active slaking.
2. As soon as this begins, add the required amount of sulfur, after sifting it to break up lumps, or make a smooth paste of the sulfur and add to the lime.
3. Stir the mixture constantly and add water from time to time to prevent burning and to bring to the consistency of a thin paste. The slaking of the lime should boil the mixture actively for several minutes. As soon as the slaking is completed, which should not occupy more than fifteen minutes, fill the barrel with cold water to prevent further boiling.
4. Strain through a sieve (twenty meshes to the inch) into the spray tank, adding whatever water is necessary to bring up to the required volume. An efficient agitator must be used while spraying, because of the heavy sediment.

Combinations. Self-boiled lime-sulfur may be combined with arsenate of lead, and nicotine sulfate preparations.

Atomic Sulfur

This is a commercial preparation consisting of very finely divided sulfur mixed with organic materials and put on the market in the form of a paste. It is diluted before using. This material has not been fully tested under Oregon conditions, but experiments indicate that during the early part of the spring, when cool, cloudy weather is likely to prevail, it is not so effective as later on during warmer weather. It is intended to be used as a convenient substitute for self-boiled lime-sulfur or sulfur dust in controlling such diseases as brown rot and mildew on peaches and other stone fruits and mildew and scab on apples when the ordinary lime-sulfur is likely to cause injury.

Injury. Atomic sulfur seems generally to cause very little spray burn. It has been found, however, to bring about serious dropping of foliage at times when applied late in the spring on apple trees that had not received any application of this material previously. The late spring application, however, caused no defoliation on trees sprayed earlier in the season with this material. It must be stated that the use of atomic sulfur in Oregon is still in the experimental stage.

Combinations. Safe with arsenate of lead and nicotine sulfate.

Iron Sulfide Mixture

"Iron sulfide mixture" made according to Ballard's formula (U. S. Department of Agriculture, Bulletin No. 120) has been found very successful for the control of mildew alone on apples in California. A simplification of this method is suggested for Oregon growers who may wish to experiment with this material.

4 pounds iron sulfate (copperas)
1 gallon lime-sulfur (33° Baume)
200 gallons water

Dissolve the iron sulfate in a few gallons of water. Fill the spray tank with water, add the lime-sulfur and start the agitator. Add slowly the dissolved iron sulfate. A black precipitate will be formed. Enough lime-sulfur should be used to combine with all the iron sulfate.

Dust Spraying

This method of controlling orchard diseases has not been tested out in Oregon up to the season of 1916. While there appear to be some possible advantages in this method, yet there are certain possible drawbacks to be reckoned with. Since this method of dealing with orchard pests has not been given sufficient practical demonstration in the United States, growers are urged to be cautious about substituting the dust method for the tested and tried methods of spraying until the fungicidal efficiency of the new method shall have been demonstrated beyond question by thorough tests under Oregon conditions, which, by the way, are distinctly unlike the conditions in any of the eastern states.

PEAR CULTURE IN THE WILLAMETTE VALLEY

Prof. C. I. Lewis, Horticulturist, Oregon Experiment Station

(This article was prepared in 1914, but not published owing to lack of funds.)

I have been asked by the President of the State Board of Horticulture to prepare an article for this report on "Pear Culture in the Willamette Valley." I am very glad to write on this subject, because I feel that the Willamette Valley has a great future as a pear district. Certain varieties of pears, at any rate, will fit in very nicely with diversified horticulture. If the horticulture of the Willamette Valley is typified by anything, it is typified by its diversification. I am inclined to believe, too, that this policy with our horticulture is very wise, especially if it is undertaken in the right way, and the right types of fruit are grown.

Diversification which incorporates such fruits as loganberries, cherries, pears and prunes, is a very good one. Some profit will be brought in every year. There is another reason why this combination is good. It is because here on the Pacific Coast we have nearly a monopoly on such fruits, whereas apples can be grown in nearly every state in the United States. Not but what we will make money on apples, or that they offer a very good field of investment, but on the other hand, I do feel that we should emphasize the line in which we have a field largely to ourselves.

I recently checked up on pear culture in the entire United States. I find that in most states it is not holding its own. I believe that the pears of the future are going to be grown on the Pacific Coast, and parts of such states as Michigan, and in the New England states. The greater area of this country will not produce pears until we can breed up strains that are blight-resistant and are adapted to the soil and climatic conditions found in most of our fruit districts in this country. It may be a long time, however, before we can breed up such strains.

Pear culture here in this State has also been very profitable. It has been one of the most profitable lines that we could take up. In considering pears as a fruit to grow there are several outlets that you should consider, such as canning, evaporation and fresh shipment, I believe that it is along the lines of canning pears, growing the Bartlett especially, that the Willamette Valley has a wonderful future. We can, however, ship out some of the varieties fresh to good advantage.

The pear is not in an experimental stage in this valley, as we already have scattered through the valley a number of very profitable orchards. The acreage of young trees is increasing very rapidly, and within five years the output of pears from this valley will be an item of considerable proportions.

The climatic factors are ideal. With some varieties we will probably have some trouble with scab, and there are pockets in the valley that will be quite frosty. Where a good location is secured, where the land is rolling there is no reason why pears on the whole cannot be grown very successfully, provided the soil is suitable. There is a mistaken idea concerning the soil for pears. It is true that the pear as a whole prefers a rather heavy clay to adobe soil, provided the soils are well drained. While perhaps the pear will stand more water, especially some varieties such as the Bartlett, than most of our tree fruits, nevertheless to get best results with most varieties, like d'Anjou, Comice, and Bosc, we must have well drained soils. We can safely believe that such fruits will not succeed well in swamp lands. If they are planted in poorly drained soils, the mortality during the first

five or six years will be terrific. Some of our river bottom soils offer a good line for certain varieties, such as the Comice. I have seen Comice trees bloom as two-year-olds, and have good crops by the time they were six years old on such soil. However, such soils might not be quite so suitable in years to come if the blight should ever become prevalent in this valley, as it might be hard to control the type of wood growth on these rich alluvial river bottom soils. The red hill soils are probably not as good pear soils as are our typical clay loams. The red hill soil might grow certain varieties. Probably the Bartlett would do fairly well. The trees seem to make a slower growth under such conditions than they do on our stronger clays.

In ordering your trees you are naturally interested in the varieties you will plant. The Bartlett is preeminently the best variety for this valley. It should be grown very largely for canning purposes. At the present prices of from twenty-five dollars to thirty dollars per ton there is a splendid profit to be made in growing this pear. It is practically an annual bearer. I have been in the State nine years, and there has not been a Bartlett failure in the Willamette Valley in that time.

The d'Anjou is one of our best later pears, coming in the fall for shipping. However, this pear should not be put in poorly drained soils. It prefers the lighter, warmer, well drained soils.

The Bosc is a splendid fall and early winter pear for this valley. It grows large, becomes handsomely russeted, is productive, and will stand pretty strong soils.

The Clairgeau is one of the best money-makers we have. While in many cases it is a low grade variety, as far as quality is concerned, in other cases it seems to develop a pretty fair quality. It bears annually, and the pears sell and ship well. There is one drawback—it has a tendency to drop its fruit quite badly about the time the fruit is matured.

The Winter Nelis must have a very deep, rich, moist soil if it is to succeed in this valley. When put on ordinary soils it is too small, it tends to scab badly, it becomes somewhat gnarled, and is not very favorable.

The Comice should be planted very sparingly. When put on some of our heavy, cold soils it makes a very discouraging growth the first few years, but will pick up after four or five years of age, and look much better. A limited number of these pears should be planted. While the price is high for this variety and the Bosc, they are varieties that are very shy bearers.

There are several new varieties which I believe should be tried out sparingly in this valley. I would not recommend them for large areas to be planted, but those people who are interested in growing shipping pears should try a few of these varieties.

One of these is the Glout Morceau. This is a splendid pear, that is ripe at Christmas time, and is a favorite in the English markets.

The Duchess Bordeaux is another pear that is worthy of consideration. The Florelle has met with much favor in California. The President Drouard in some districts is said to be superior to the d'Anjou. It out-bears it and is of considerably better quality. The Santa Claus pear is worthy of a tryout in a small way. There are a few varieties that are especially good for home use in this valley, such as Clapp's Favorite, Belle Lucrative and Seckel. The latter is one of the best table pears we have. While it is very small, it is juicy, fine-grained and sugary. It is also one of the best varieties we have for spicing.

In ordering your pear trees, order one-year-old, budded, whole-root trees, if it is possible to get the same. The piece-root trees, and

many of the grafted root trees, have not done as well in this valley. There are two kinds of roots offered. One is the French root, formerly the only one used, but it is not very resistant to blight, and is attacked by the root louse. On that account, we have been using lately mostly the Sand pear, or Japanese stock. This overcomes the former difficulties and is a nice stock to use. We do not know yet, however, just how well this stock adapts itself to all soils. The trees may be planted either in the fall or in the spring. I would avoid, however, planting the trees in ground that is water-soaked, never setting the trees in a hole that has standing water. Neither should the holes be dug on heavy clay soils several weeks before the trees are to be planted. I have made up my mind that many trees have been killed because they have been planted in heavy, water-logged soils.

The average distance should be about twenty-five feet apart. Spreading varieties like the d'Anjou and Winter Nellis, should at least have this distance. Possibly some of the upright varieties, like the Clairgeau and Bartlett, could be planted a little closer.

There is very little I need to add in regard to tillage. The tillage of a pear orchard is about the same as the tillage of any other orchard. I would want to call your attention, however, to two very important points in the tillage of the pear. First, you should aim to grow a good sturdy, but not too strong tree. If the tree produces rank wood and the fire blight attacks it we might have hard work saving it. The tillage of the pear should take place as early in the spring as possible, because the pear makes its growth early and also ceases its growth earlier than does the apple or most of our other tree fruits. In fact, in some of our rather moist summers, the pear will often cease its growth by the middle of July. At least, this is typical of many of our young trees. You should, therefore, get on the land early, prepare it well, and get it in good condition so that the trees can receive the proper stimulus. It is fatal to put off the preparation until late. I know of people who have waited until June, and the trees have quit growing by the middle of July, and made very little growth.

In pruning, the same system is followed which is used with our apples. However, most of the growers prefer what is known as the open tree, rather than the leader tree, and it is generally believed that should the fire blight attack the orchard it is much easier to control it in an open tree than it is on a leader type of tree. However, I want to call your attention to this, that if the trees are so started that four or five branches all come out at one point, you are going to have a weak crotch. If fire blight gets in that crotch, you may lose your entire tree.

Personally I prefer what is know as the modified leader type, that is, growing the tree to a leader for the first two years, and then suppressing your leader. In this way you get a splendid spacing of your main scaffold limbs. The further apart you get these branches, the better, and by growing the tree in the manner I have suggested, you can get a much stronger, better spaced tree than is possible with the average typical open center tree. At any rate, I would avoid the typical leader tree, which is the type the pear would take naturally if left alone. Whether you grow the typical open tree or the modified leader, the pruning is very much the same the first few years. The only difference is that with the modified leader you allow one of the branches to take the form of a leader for two years, and then suppress it. In forming the body of your tree, select four or five branches, and these should be so pruned that they will be

pretty well balanced. To do this you should always prune the strongest branches the most and the weaker branches the least. If you do it just the other way round, which is what most growers practice, you will gradually be making the larger branches larger and the smaller branches will become smaller. At the end of the first year, we generally cut these branches back and make them from eight to fifteen inches in length and allow two branches to grow on each one of the former scaffold branches. From this time on we can treat each one of these branches as a separate tree, so to speak, and grow it as a leader; that is, instead of cutting back each one of these branches which grow on the scaffold branches equal amounts, cut one less than the other, so that one continues the branch, and whatever others are grown become side branches. In this way you will avoid the miserable "U" formation of equal forks one finds many times all over the tree. These of course break very easily with a heavy crop. After the trees get to be four or five years old, let up very materially on the pruning, even though they do appear to have a little too much wood on the inside, You want to bring them into fruiting. You don't want to force them continually into wood. This is especially true of the later varieties like Winter Nellis, d'Anjou, Bosc, etc. After the trees are well established avoid heavy cutting, because this only means that you will have a sappy, succulent growth, which will be very easily destroyed by the fire blight, if we should be so unfortunate some time in the future to have this trouble in the valley.

Many of the growers make a mistake in dehorning old pear trees. They let the trees get pretty rangy, and then they cut off about two-thirds of the top. By the time the new growth is in bearing again, you are just about where you were before, and have not gained anything, and you have just simply forced the tree all to wood. I would suggest that instead of trying this practice you thin out with hand-shears, some of the weaker spurs, and throw the entire growth into a less number of spurs, and this will seem to revitalize the entire tree. After the trees are once established, you will want to practice moderate annual pruning. The d'Anjou will stand more pruning than most other varieties. It tends to bloom very heavily and thin very lightly. I believe that a moderate annual pruning helps to set more fruit.

In planting your orchard you must pay some attention to pollenation. The Comice is practically sterile. The d'Anjou is so nearly so, that we might just as well call it sterile. You should therefore plant your trees in oblong blocks, from two to six rows of a variety. Of the early bloomers that will inter-pollenate successfully, the Bartlett, Clairgeau and d'Anjou work very nicely. Of the late bloomers, the Bosc, Comice and Winter Nelis work nicely together.

Pears have been planted quite generally on some of our farm lands that have been in wheat and oats for fifty years. Where this is the case, this land may be fertilized to a certain degree by either the use of manures or cover crops. I have had experience with cover crops on such land, and have found that they build the soil up very rapidly. They will give the organic matter that is necessary to insure the physical condition of the soil, will give you added nitrogen, and also help out excessive moisture in the spring, so that you can get on the ground a little earlier than would otherwise be true. Nothing is better than the vetch and rye here in the Willamette Valley. The ordinary forage vetch, at the rate of about forty pounds to the acre, with ten or twelve pounds of rye mixed with it, drilled in by the latter part of August or first of September is the best combination we have yet tried in our orchards. Where the land tends to be very heavy, if you can get hold of some

stable manure and spread this around the trees and incorporate it in the ground it will help very materially in giving the trees a good start. You could overdo the use of manure and cover crops with pear trees, especially if it tends to force them into a rank growth. This must be avoided at all times. You must try to get the firm, close-celled, hard wood growth, and not the rank, succulent, sappy growth. Whenever you see an indication that the trees are going to make an undesirable growth, it is better to let up on the pruning; don't give them too much tillage; avoid the use of commercial fertilizers, manures, or cover crops. Commercial fertilizers have never been tried very extensively in our pear orchards. It may be that in some of the older orchards it would pay financially to use commercial fertilizers. However, we are going to avoid using too much of the nitrogenous fertilizers, and probably we will have to work out on this cheap land the best fertilizers to use under the conditions.

In growing pear trees you are going to have trouble, just the same as you do in growing anything. In fact, I believe if it wasn't for the trouble there wouldn't be any money in the business. The man who overcomes the troubles is the one who is making money. There are some troubles called physiological troubles, with pears, a good deal like the little-leaf and rosette, where the trees do not grow very well, the leaves never come up to full size. Part of the tree will die, sometimes clear down to the ground, and a new sprout will come up. Sometimes it will not sprout at all. Then there is a good deal of sour sap and sun scald. We believe that sour sap, for instance, is akin to troubles like little-leaf, and is caused by a combination of soil and climatic conditions. Where the weather is uniformly good in the early spring, and the ground has been well drained, and the winter has been mild, we see less of this trouble than where we have warm spells in February followed by cold weather in March and April and May, or where we have it very warm in the middle of the day and cool at night. On early land, you may have to take some steps to ward off frost attacks. If the pear starts so early in the spring that sunscald will take place in March, considerable damage may result.

From the plant disease point of view, there are two diseases we have to watch very carefully. One of these is fire blight. This is a bacterial disease, and the only remedy we have at this time is to cut it out, sterilizing the instruments and wounds where you have cut. It would take an article in itself to treat of fire blight. Various bulletins and articles have been written on it, so I will not dwell on this subject at this time. The other disease which will have to be watched is that of pear scab. This is quite bad with some varieties in the valley. We will have to systematically spray the trees, at the time the blossoms are in the pink, at the time the petals are falling, and from three weeks to a month afterward, depending upon the season and the variety.

The only insect that has given us much trouble with the year so far is the pear slug. This can be very easily treated by spraying them just as they begin to appear with arsenate of lead. Unless they are sprayed, they will tend to devitalize the trees, and in some cases you will actually lose trees, as the result of the ravages of this insect.

There are two pear boxes used quite generally in Oregon. What is known as the bushel box measures eight and one-half by eleven and one-half by eighteen inches. The half box has the same width and length but only half the depth, and is used for the finer grades. Pears packed in half boxes and the better grades packed in the bushel

boxes should be wrapped; and it generally pays to use lithographs. In the very fancy grades, lace paper and fancy inside lithographs can be used to advantage. The system of packing the pear means that we can get along with a much smaller number of packs than are used with the apple. The packs that have been used in this State for the past few years are shown in the following table:

STANDARD PEAR PACKS

Tier	Style	Row	No. in Box
5	4-3	6-6	210
5	4-3	6-5	193
5	3-3	6-6	180
5	3-3	6-5	165
5	3-3	5-5	150
5	3-3	5-4	135
5	3-3	4-4	120
4	3-2	6-5	110
4	3-2	5-5	100
4	3-2	5-4	90
4	3-2	4-4	80
4	3-2	4-3	70
4	3-2	3-3	60

The diagonal pack is used for all pears.

Pears are generally packed directly from the picking box and the rules for packing are about the same as in the case of apples. They are generally packed with a much greater bulge, however, than is customary with apples, since the shrinkage of the pear is greater than that of the apple.

Very little progressive work has been done in the marketing of the pear. I have written letters to most of the market centers, and find that many of them do not know about our Oregon pears at all. Others do, and speak very highly of them. I find that perhaps no two cities prefer the same varieties, and that one commission man in a city will prefer one variety, while his neighbor commission man in the same city will prefer other varieties. Very little advertising has been done with the pear. When I was in the east last fall and winter, I especially noted in such markets as New York and Boston and Chicago, as to how many pears were offered on the market, and how they were advertised. I found in very few cases were the pears named; often where they were named, the names were incorrect. The lithographed advertisements were not used as extensively as was the case with the apple. I am satisfied that we could take a variety like the Bosc, which is a superb pear, and by a little advertising we could increase the consumption of this pear ten-fold. With a little better distribution and advertising this pear should have a very bright future, authough I candidly believe that one of the best openings, especially here in the Willamette Valley, is in growing the Bartlett pear commercially, for canning purposes.

The European outlook is very good, especially for certain pears. The Winter Nelis, the d'Anjou, the Glout Morceau take very well. They do not want our pears too early in the fall, neither will they take very many of them after the latter part of January, for from that time on, the Bartletts are arriving from South Africa. It is pretty hard to get rid of cold storage fruit, when you can get fresh Bartletts.

There is no reason why, if a man will practice good horticulture, he cannot make a great success of pear culture in this valley. I am satisfied this valley will become famous in years to come for the production of pears.

EVAPORATION OF FRUIT IN OREGON.

By H. M. Williamson, Secretary of Oregon State Board of Horticulture.

(Prepared in 1914 for Thirteenth Biennial Report which was not published.)

A few years ago the belief prevailed that the use of dried or evaporated fruit was destined to decrease. Instead of decreasing the consumption of dried and evaporated fruit has increased more in the past fifteen years than ever before. The United States census returns show that the total production of dried fruits in the United States increased from 85,439,406 pounds, valued at $4,757,005.00, in 1899, to 400,328,767 pounds, valued at $19,840,395.00 in 1909. The values of the different kinds of dried fruits produced in 1899 and in 1909, as given in the Census, were as follows:

	1899	1909
Prunes	$ 970,927	$5,130,412
Raisins	1,062,268	4,837,933
Apples	1,906,642	3,098,095
Peaches	312,495	2,423,083
Apricots	455,279	2,277,177
All other	49,279	2,073,095

Oregon has specially favorable conditions for the production of fruit. Its handicap is the cost of sending it to the great consuming markets of the world. Even when marketed in the United States the freight charges on fresh fruit amount on an average to more than the grower receives for unpacked fruit. When shipped to foreign countries freights and duties make the cost of Oregon fresh fruit so high that but a small percentage of the people can use them. Drying the fruit takes away from two-thirds to five-sixths of the weight and freight charges, and in most foreign countries makes duties relatively less.

It is not known whether or not Oregon can produce at a profit great quantities of dried or evaporated fruit at prices which a great number of people throughout the world can afford to pay. California has proved that it can do this, but that state has an advantage in that fruit can be dried without the aid of artificial heat. This advantage is, however, of doubtful value in the case of fruits which are cut before drying. To prevent discoloration from slow drying and fermentation from the same cause it is necessary to expose the cut fruit to sulfur fumes for a length of time which materially injures the flavor of the fruit, and probably makes it less healthful as a food. Even in the case of fruits dried whole Oregon has been able to make a decided success in drying prunes in evaporators.

The words, "dried," "evaporated" and "de-hydrated" all actually mean the same—the removal of moisture. When used in connection with fruits and vegetables the word, "evaporated", has acquired a special meaning and signifies that the fruit or vegetable to which it applies has had its moisture taken away by causing heated air to pass rapidly among the fruit or vegetables. This process, by reason of its more rapid effect, leaves the fruit with more of the qualities of fresh fruit than is the case when the fruit is dried slowly in the open air, or is partially cooked in the course of drying in slowly moving and consequently moist, heated air.

General Principles of Evaporation.

In practice all drying or evaporating is ordinarily done by having the moisture in an article drawn out of it by air. Under natural conditions air always contains some moisture. At any particular temper-

ature a given quantity of air can contain only a fixed amount of moisture. When the air contains all the moisture it can hold it is said to be saturated. If the air is saturated and the temperature falls some of the moisture is thrown out of the air, and this is what causes rain. If, however, when air is saturated the temperature rises, the air becomes capable of taking up more moisture and tends to draw this additional moisture from any moist article with which the air comes into contact. At a temperature of zero, Fahrenheit, one cubic foot of air will hold only .545 grains of water. At sixty degrees above zero a cubic foot of air will hold 5.756 grains of water. At 167 degrees of temperature a cubic foot of air will hold 105.168 grains of water, and at 194 degrees, 210.336 grains. It will be seen that a cubic foot of air at a temperature of 195 degrees holds about forty times as much water as it does at a temperature of sixty degrees. Air may hold all the water it is capable of at a temperature of sixty degrees, but if the same air is raised to a temperature of 140 degrees without having an opportunity of taking up moisture it is then extremely dry and powerfully attracts moisture from any damp article it comes in contact with. The smaller the amount of moisture in air in proportion to its capacity to hold water, the more rapidly it takes up moisture from articles with which it comes in contact. Air under natural conditions usually contains from forty-five to eighty per cent of the amount it is capable of holding at any given temperature. When the percentage of saturation is below fifty the air is quite thirsty. When the percentage of moisture is as high as eighty the air will take up additional moisture very slowly. We do not know how near the air can be to the saturation point at the time of passing out of the evaporator, and yet do economical and satisfactory work. It must be remembered that evaporation is a cooling process, and cools both the article from which the moisture is taken, and the air which takes the moisture. If a quantity of undried fruit should be heated to 140 degrees, and dry air heated to 140 degrees passed rapidly among the fruit the temperature of both fruit and air would be reduced much below 140 degrees. A number of years ago the writer was at an evaporator owned and operated by A. A. Quarnberg, of Vancouver, Washington. The evaporator was so constructed that the air passed among the fruit of only one tray before escaping from the evaporator. The temperature of the air as it reached the fruit was 210 degrees. Prunes were inserted in this evaporator, and after six hours a tray of prunes was taken from the evaporator and the fruit was immediately packed around a thermometer taken from the evaporator. When taken from the evaporator the thermometer showed a temperature of 210 degrees. After two minutes it showed a temperature of 140 degrees. As the amount of moisture in the fruit lessens, the amount evaporated in a given time lessens and the cooling is lessened. It is a well known fact that when prunes have become dry enough to be removed from the evaporator the fact is usually determined from the fact that the prunes have then become hot, as the evaporation at that stage is so slight that the temperature of the fruit becomes nearly the same as that of the air. If the fruit itself becomes hot while yet full of moisture, that moisture will be so much expanded by the heat that the fruit cells will burst and the juices run out.

Good results can not be obtained in evaporating fruits or vegetables unless the evaporator is so constructed and managed that there is a continuous and fairly uniform circulation of air among all of the fruit or vegetables. If the circulation is too slow in any

portion of the evaporator the fruit or vegetables there will cook if the air is hot, or if it is not hot enough to cook the fruit mould will set in. Under such conditions the fruit cells burst or break down and the juices drip from the fruit. Whenever the juice drips from prunes or other fruit in an evaporator it is evidence that there is not enough circulation of air. If fruits or vegetables are evaporated at a low temperature by very rapidly moving currents of dry air, the dried product, when soaked, will more nearly resemble fresh fruit or vegetables, as the case may be, than when the evaporating is so done that the fruit or vegetables reach a temperature of 160 degrees or more before being finished. It is often assumed that this is the one thing most of all to be sought in drying fruit, but such is not always the case. The sugar found in fruit is first developed as starch. When fruit is ripening a substance called diastase develops in the fruit and this diastase transforms starch into sugar. This transformation is most rapid when the temperature of the starch and diastase is between 140 and 160 degrees Fahrenheit. If the temperature is raised above 160 degrees the power of the diastase to act upon the starch is destroyed. It is usually the case that a considerable portion of the starch in fruit has not been transformed into sugar at the time when the fruit goes into the evaporator. If the drying is done quickly at a comparatively low temperature only a small part of such starch will be changed into sugar, but at a temperature of 140 degrees the transformation is rapid. Sugar is practically a combination of starch and water, and the transformation of all the starch in the fruit into sugar during the course of evaporation not only makes the fruit sweeter, but also increases the weight of the dried product. In the case of Italian prunes this is of especial importance. It also appears to be the case that Italian prunes are improved in both flavor and texture if the temperature of the fruit is raised to at least 160 degrees before they are taken out of the evaporator.

The majority of evaporators are so constructed that the fruit either starts to dry with the air at the highest temperature used and is finished where the air is much lower in temperature than at the starting point, or vice versa. It is the prevalent opinion that in the case of fruits which have a firm skin and are dried whole it is best to start the drying at the cool end and have the fruit approach the heat, finishing at the highest temperature used. In the case of fruits which are cut before going into the evaporator the authorities recommend placing the fruit at once in the hottest air as doing this hardens to some extent the outer surface of the fruit and tends to preserve the appearance and form of the fruit. Some evaporators are so constructed that the fruit can be made to either approach or recede from the place at which the heated air enters. This is a decided advantage when an evaporator is to be used for different fruits.

Fruit Evaporators.

For information about fruit evaporators and their construction, look up the excellent article on "Fruit Evaporators in Oregon," by Prof. F. R. Brown, of the Oregon Experiment Station, which is in this volume. In addition to what is stated in that article a few suggestions may be made. In the case of tunnel evaporators, the tunnels are almost always made too long. In the case of stack evaporators it is common to find too many trays in each stack.

As fruit growers in Oregon learn to work together in preparing their fruit for marketing the number of evaporators owned and oper-

ated by individuals will decrease. The great number of individually owned evaporators now in existence in Oregon were necessary because there was no other way to get the prune crop dried. The difficulty of getting competent help for the operation of evaporators imposes too many duties on the fruit grower who must at the same time oversee the operation of the evaporator and the gathering of the fruit. There is also a steadily growing demand for standardizing all products including evaporated fruits. It is very hard to bring this about when the fruit is dried in a great number of evaporators scattered all over the country. The improvement of roads is making it easier to haul fresh fruit to central drying plants. In the aggregate a much smaller amount of capital is required when a number of growers join in establishing a central plant than when each erects and equips an individual plant. The central plant, by operating on a number of different fruits can be kept in service a much longer time than is usually the case with plants operated only on the owner's fruit. In an investigation made a number of years ago it was found that the fuel and operating cost of drying prunes was almost invariably less in large plants than in those of less capacity. The central evaporating plants which are most successful are those owned by associations of growers which are organized for the purpose of preparing for market and marketing all the fruit of the members or stockholders.

In evaporating cut fruits, trays made with wood slats should be used as the acids in the fruit may take up some of the zinc if trays made with galvanized wire cloth are used. In some countries evaporated fruit which shows the marks of wire cloth can not be sold.

Prunes.

Up to the present time the production of evaporated fruits in Oregon has not been large except as to prunes. When the Oregon prune growers commenced to dry or evaporate prunes they were obliged to learn the business by experimenting. There was great interest in the subject of prune evaporators for a number of years and a great number of evaporators of different styles or with different features were devised and many of these were patented. The two types now in most common use have been the outgrowth of evaporators previously invented and patented. The stack dryers have been based upon the Plummer and Alden evaporators, and the tunnel evaporators have followed in general the style of the old Great American evaporator.

A number of evaporators of types wholly different from the stack and tunnel were introduced and some of these did remarkably good work. Some of the largest evaporators have used steam to good advantage.

Carelessness in gathering prunes and preparing them for the evaporator is most injurious. No prune affected with brown rot should go into the evaporator if it can be avoided. Prunes are often picked before they are ripe, which causes loss in both quality and quantity. It appears to be an economic necessity to dip prunes in boiling lye before they are dried. If the prunes are thoroughly rinsed in clean water after the dipping in lye there is not much to object to in the lye-dipping process. Dipping in lye followed by a thorough rinsing cleans the fruit. It too often happens that the supply of rinsing water is inadequate and that much lye and dirt is left on the prunes to their great detriment. If possible there should be a continuous inflow of clean water into the rinsing tank.

It is possible, in a properly constructed evaporator, to dry French (Petite or Agen) prunes in from nine to twelve hours, and Italian prunes in from sixteen to twenty hours, but the observations of many operators show that it is better to take more than those amounts of time. If the drying is done either too quickly or too slowly there is loss of both quality and weight. In seasons when the prunes develop a large percentage of sugar less time is required for drying than when the fruit is less sweet. In some seasons it happens that rains a few weeks before the time of ripening cause the prunes to have an unusual amount of moisture. In other years the prunes ripen up with an unusually small amount of moisture. These things affect the length of time required for drying the fruit to the best advantage. Ordinarily the best results appear to be obtained when Italian prunes are dried in from twenty-four to thirty hours. A large majority of those who dry prunes prefer to have the prunes start to drying at a moderate temperature and to finish at a materially higher temperature. Air temperatures of from 130 to 140 degrees where the prunes enter the evaporator, and of 170 to 180 degrees where the prunes are taken out meet the approval of many. Some operators prefer a uniform temperature from start to finish which can be had only in evaporators of such construction that either the hot air passes among very few prunes or the construction allows heat to be continuously applied to the air in the course of its passage through the evaporator. In such cases a temperature of about 160 degrees is recommended. The less sugar there is in prunes the dryer they must be made. It is quite possible to dry prunes too much, but it is more common to dry them too little.

Loganberries.

The industry of producing evaporated loganberries originated in Oregon through the efforts of the State Board of Horticulture. In the spring of 1917 W. K. Newell, then president of the State Board of Horticulture, had become convinced that some new outlet must be found for loganberries as the demand had not kept pace with the supply and prices were unprofitably low. At his instance the Dayton Evaporating Co., of Dayton, Oregon, evaporated some of this fruit during the summer of 1907. In his semiannual report made to the Board October 14, 1907, and published in the Oregon Agriculturist, October 15, 1907, Mr. Newell reported on the matter as follows:

"The acreage of loganberries has increased so rapidly this year the market was temporarily over-supplied. However, consumption will increase rapidly as this splendid berry becomes better known. The Weber-Bussell Canning Company say they will can all the loganberries that are offered them next year. Also, I am convinced there will be a splendid market for this berry in the evaporated state. The Dayton Evaporating Company this year dried quite a quantity of them. They dry in about the same time as Italian prunes and make about one pound of dry fruit to six pounds of fresh. Samples of the dried berries were sent to a number of eastern dealers and brought very favorable replies. The eastern trade wants something of the kind for pie timber; heretofore they have depended on New York evaporated black-cap raspberries, but of late blight has ruined many large patches of these berries in New York and they are forced to look elsewhere for a substitute."

Mr. Newell called attention to loganberries by the results of this experiment at a number of meetings of fruit growers held during

the following winter, and in the summer of 1908 several growers evaporated loganberries. There is much yet to learn about the best and most economical methods of evaporating loganberries, but the matter is receiving careful attention from the horticultural department of the Oregon Agricultural College. An excellent discussion of the subject is contained in Bulletin No. 117, of the Oregon Experiment Station, prepared by Prof. C. I. Lewis, Horticulturist of the Station, and Mr. F. R. Brown, Research Assistant in the Horticultural Department of the Station. It is evident that many of those who have been evaporating loganberries have not yet learned the importance of keeping the air moving rapidly through their evaporators. As it requires about five pounds of fresh loganberries to make one pound of evaporated product, an evaporator which will hold five tons of fresh loganberries must have enough air pass through it to carry off four tons of water before the load of fruit is dried. From the length of time required to dry loganberries, reported by most of the operators it appears practically certain that they are not using enough air and are wasting both heat and room. The bulletin referred to states that most of the evaporators used in drying loganberries have tunnels from twenty to thirty-four feet long and properly condemns the use of such long tunnels. Loganberries give up their moisture more readily than prunes and consequently cool the air much faster. In a tunnel thirty feet long used for drying loganberries the cost of drying must be very materially greater than when a tunnel of half that length is used. The experiments reported upon in the bulletin mentioned strongly suggest that the best results are obtained in evaporating loganberries when the temperature of the air where the fruit is introduced is about 130 degrees, and that at the point where the fruit is finished, about 150 degrees.

Apples.

The production of evaporated apples has never been large in Oregon. It is probable that there will be much increase in the output in the future. A market can be found for a large quantity of evaporated apples provided they can be produced here with profit at a price low enough to be within the purchasing power of the laboring classes of Northern Europe. By proper methods a great increase could be made in the demand for evaporated apples in the United States and Canada. When apples are properly evaporated and are not spoiled by sulfur the evaporated product is often superior to fresh apples for making pies or sauce, notwithstanding the long-standing prejudice against dried apple pies. If the evaporated apples are not diluted too much when they are prepared for use they are richer in flavor than the fresh fruit. In an evaporator with ample circulation of air, evaporated apples of a fine, rich color can be produced without any sulfuring, provided the apples go promptly into the evaporator after they are peeled and sliced. After being stewed these apples do not differ materially in appearance from those which have been bleached. It is a matter of educating the market to accept the unsulfured article in place of the unnaturally white article now demanded. The sulfur materially injures the flavor of the fruit, and perhaps also affects its healthfulness. Some foreign countries will not allow the sale of fruit which has been treated with the fumes of sulfur. To meet market requirements it is now necessary to treat the freshly cut apples with the fumes of sulfur, but the time of exposure should be short.

It is probable that the greater portion of the evaporated apples of Oregon will be made from apples which are of the standard market

varieties but are not quite good enough for shipment to distant markets. This is not wholly certain. Elsewhere in the United States there is an observable tendency to produce the bulk of the output of evaporated apples in districts which make the production of apples for sale to evaporating companies a business. If apples are to be grown in Oregon especially for evaporating the Waxen is likely to be the most profitable variety, at least to the west of the Cascade Mountains. In general the best varieties of apples for evaporating are those which contain the largest percentage of sugar, as they are the varieties which yield the largest percentage of evaporated product. Strange as it may seem sour apples usually contain a larger percentage of sugar than sweet apples. Apples taste sweet as a rule because they have very little acid in them, and they taste sour because they contain a large amount of acid. A number of years ago the Virginia Experiment Station made quite an extensive investigation of methods for utilizing unmerchantable apples. In the course of this investigation analyses were made to ascertain the percentages of sugar and acid contained in apples commonly grown in Virginia. The results as to some of the varieties which are also grown in this State were as follows:

Variety Apple	Per cent Sugar	Per cent Acid
Maiden Blush crab	13.58	0.32
Roxbury Russet	12.23	0.58
Winesap	11.60	0.40
Grimes Golden	11.28	0.21
Transcendant crab	11.27	0.70
Jonathan	10.99	0.20
Baldwin	10.06	0.48
Albemarle Pippin (Yellow Newtown)	10.04	0.45
Wealthy	10.04	0.45
Duchess of Oldenburg	76.1	0.70
Red June	7.47	0.42

In 1904, Geo. T. Powell, a prominent apple grower of the state of New York, in an article published in the Country Gentleman, said that he found on an average one bushel of Ben Davis apples returned five pounds of evaporated product; one bushel of Baldwins or Greenings, seven pounds of evaporated apples and one bushel of Russets, nearly eight pounds of evaporated apples. The leading producer of evaporated apples in Oregon during the past ten years or longer has been D. A. Snyder, of Dayton, Oregon. At the annual meeting of the Oregon State Horticultural Society, held in 1913, he presented a paper on "Evaporation of Apples," which is published in this volume. Farmers' Bulletin No. 291, issued by the U. S. Department of Agriculture, Washington, D. C., is useful to those who are interested in the evaporation of apples.

Cherries.

Enough has been done in Oregon to suggest the possibility of developing a moderately profitable business in the production of evaporated cherries. There is an established market for dried sour cherries, but, so far as is known, Oregon has not evaporated any sour cherries for market. It is probable that in this State it will pay better to grow sour cherries for canning than for drying. Royal Anne cherries, when evaporated, appear to find a market more readily than the other sweet cherries which have been tried. It is possible that the Lambert may

prove satisfactory in an evaporated form. The inferior varieties of sweet cherries do not produce a satisfactory product when evaporated. In 1897 Mr. J. R. Shepard, then living at Zena, Oregon, reported success in evaporating cherries whole. The dried cherries weighed about one-third as much as the fresh fruit. The Royal Anne cherry when dried whole has a better flavor than when the fruit is pitted before drying, but the market appears to prefer the pitted form.

In 1898 the Newberg Graphic published the following statement made by E. H. Skinner (who died a few years ago):

"Last year I dried 500 pounds of Royal Annes with seeds in. They were fine but would not sell at a paying price, six cents being all I could get for them. I made a small pitting machine, pitting twenty cherries at each turn of the crank. To my surprise we pitted my entire crop of eight tons and would have done much better if I could have dried them fast enough. We pitted, spread and put in the drier 2,400 pounds of cherries in three-fourths of a day, with one girl to turn crank, one to spread cherries in machine, and two spreading on trays and putting in drier. I now send you sample to see if you can find any scar to show they were ever punctured. I pitted one ton of Major Francis and found it took seven pounds of green to make one pound of dried, and ten gallons of juice came from this ton of Major Francis. To my surprise four pounds of Royal Annes made one pound of dried and from seven tons we did not save one gallon of juice. Cost of picking at fifty cents per hundred pounds makes for the four pounds required for one pound of dried, two cents; labor, pitting, drying and taking from trays, one and three-fourth cents; ten-pound boxes with waxed paper cost seven and one-half cents and the fruit can be packed for two and one-half cents per box, which will make ten cents per box or one cent per pound, making a total of four and three-fourth cents per pound. Now if they only sell for fifteen cents per pound it makes Royal Annes worth two and one-fourth cents per pound on the trees, less commission and freight."

In the foregoing Mr. Skinner appears to have omitted cost of fuel and the proper charge for the use of evaporator and machinery. Wages are also higher now than they were then, and it is not probable that with evaporated pitted Royal Annes selling at fifteen cents per pound the fresh cherries would realize the grower more than one and a half cents per pound, unless it is possible to do the work more advantageously than Mr. Skinner did at that time. Mr. Skinner subsequently made a cherry-pitting machine which operated by steam power and pitted 144 cherries at each revolution. This machine also spread the cherries for the pitting. Mr. Skinner also, in a year subsequent to the one to which his statement referred partially crystalized his Royal Anne cherries, making an output of several thousand pounds. He did this by dipping the cherries, after they were pitted and before they were placed in the evaporator, in boiling syrup. Part of the product was taken from the driers before they were fully dried and dipped a second time in boiling syrup. As the finished cherries sell for about two or three times as much per pound as the sugar costs, the sugar taken up by the cherries probably more than offsets the cost of the extra labor involved in this process, and the product has a decidedly attractive appearance.

Pears

The output of evaporated pears in Oregon has never been large and is probably less now than it was ten or fifteen years ago. There is no available information to justify any prediction as to the possibility

of producing evaporated pears profitably in this State, but the matter should receive enough attention to settle the question. The best flavored product is obtained when the pears are cut in halves and dried without peeling and without removing the cores. Drying large pears in this way takes a long time. If pears are free from scab and other blemishes the skin can be easily slipped off if the pears are dipped whole in boiling lye, such as is used for dipping prunes, before drying. Pears can also be peeled like apples, but if the cores are removed the work is usually done by hand labor. In his report as a member of the Oregon State Board of Horticulture, made in October, 1894, Col. Henry E. Dosch reported that he had that season evaporated 9,000 pounds of Bartlett pears. One-half of the pears were peeled and these gave thirteen and one-half pounds of dried pears for each hundred pounds of fresh fruit. The other half of the pears were cut in halves and were neither peeled nor cored, and yielded nineteen and one-half pounds of dried frut for each hundred pounds of fresh pears.

After pears have been peeled and cored they are sometimes immersed in boiling water for a few minutes or subjected to steam which is better if facilities are at hand. This gives the dried fruit an almost translucent appearance. A fine article can be made by dipping peeled pears which have been quartered in boiling syrup before placing the fruit in the evaporator.

FRUIT EVAPORATORS IN OREGON

By F. R. Brown, Research Assistant in Horticulture, Oregon Experiment Station

(Prepared in 1914 for Thirteenth Biennial Report which was not published.)

Fruit evaporators, as they exist in Oregon, are the results of more than forty years' experience. The first evaporators, built to meet local conditions and individual necessities, were very inefficient. The earliest attempts at adjustment to local conditions often ended in failure; new evaporators were often built, tried during one season and remodeled for the next. By this constant changing inferior plants were eliminated and, gradually, distinct types were developed.

The earliest forms of evaporators were what are now known as "box driers"; in most instances they were cheaply constructed of rough lumber. Poor arrangements of the working parts requiring the fruit to be handled many times during the drying process made the cost of operation very high. This was especially serious during the years when the price of the finished product was very low, and has been the leading factor in the search for a better evaporator. The present "stack evaporator" is the old "box drier" brought up to date. The same high quality of fruit is produced and the labor reduced to the minimum.

The stack and tunnel dryers represent the two main types of evaporators; the former used principally for prunes and the latter well adapted not only for drying prunes but for almost any other product which may be evaporated. Most of the stack driers in operation at the present time are patented and have changed but little during the last few years. The tunnel evaporators on the other hand are being changed each year. There are some patent types, for which plans may be obtained, but many of the best tunnel evaporators are not patented and each represents one man's ideas of the essential features of such a plant.

Probably at no time during the history of evaporation here has this State been free from exploiters of new evaporators. Many of the driers, evaporators, dessicators, and dehydrators that have been widely advertised and for which extravagant promises have been made, are fairly successful, but usually prove a disappointment in actual trial. One of the most serious problems confronting these patented plants is their cost, which, in most cases, is prohibitive even for the large grower. They are, therefore, out of the reach of the individual grower. The existence of this class of evaporators indicates a desire for improved methods and emphasizes the need of some careful work to determine the factors or conditions that influence or control the production of the best dried fruit.

During more than forty years of fruit evaporation in this State there has been no careful, systematic investigation of the fundamental principles involved. The quality of the product and the amount obtained from a given amount of fresh fruit has remained the same. Seasonal differences and the skill of the operator are commonly accredited with causing the great variation when they have been only minor factors in influencing the final results. Numerous investigators have carried on experiments at various times but have confined their efforts to one variety of fruit, have been content to learn the drying time under one condition, have carried on their work for only one year, or have left no written record of their work and results. Little information, therefore, is available for the benefit of the beginner in evaporating fruits.

There are, however, certain methods in use with the different fruits, which, through common usage, have come to be accepted and followed by most operators. Apples, pears and peaches are usually started at a fairly high temperature and that heat maintained or only slightly increased during the evaporation process. With fruits, such as prunes and most of the berries, which are evaporated whole, the common practice is to start the drying at a low temperature gradually increasing the heat until the last few hours of the process the fruit receives the highest temperature. However, a recent report on the evaporation of the loganberry would indicate that this division into two classes is not entirely correct and that a change of method, at least with some of the fruits, would be very beneficial.

Evaporators for this State must be designed primarily for drying prunes but the increasing importance of the other evaporated products necessitates the construction of a plant which will successfully care for all kinds of fruits, berries and even some of the vegetables. The present evaporators depend upon both heat and circulation of air although too little importance is attached to the latter by many of those engaged in the business. The arrangements to produce and control these factors are varied and often defeat the purpose for which they were designed. The question, then, of what type of evaporator will be used in the future is not so important as that of how our present types may be changed to widen their adaptability and increase their efficiency.

The kiln evaporator adapted only for the drying of apples offers little that could be changed without entirely destroying its effectiveness. Its simple construction and low cost of operation together with the quality of the finished product places it as one of the best for apples alone. In the stack evaporator changing any of the essential features, with the possible exception of the ventilator, would necessitate a readjustment of all parts. In this type the moisture laden air is carried out in the most natural way and yet the stack and ventilator are often arranged so they retard rather than increase the circulation of air. This feature alone offers the greatest problem to be met in increasing the adaptability of this type.

The tunnel evaporator probably offers the most promising field for the experimenter. In this type an almost unlimited number of variations may be had in the construction of the building and working parts. Variations in the arrangement of the floor plan, length, height, or slope of the tunnels, size and arrangement of the heating chamber, location of the tunnels in relation to the source of heat, or the size, location and construction of the ventilator will all have their effect. This may show in the quality of the dried fruit, in the time of drying, or in both. But in either case the cost of the operation will be changed thus affecting the efficiency of the plant.

Any evaporator built and operated by the individual grower must even under the most favorable conditions stand idle for a great part of the year. The initial cost of future plants, therefore, must be low compared to the capacity if they are to compete with the present types. Larger plants that operate for three of four months of the year may be more expensive since the interest and depreciation charge per ton, a very important item, would be greatly reduced.

TABLE I.—AVERAGE COST OF DRYING PER TON OF EVAPORATED FRUIT

Fruit	Labor	Interest and depreciation	Insurance	Wood	Total
Prunes	$ 8.00	$ 7.20	$1.80	$ 3.40	$20.40
Apples	15.00	5.60	1.80	2.00	24.40
Loganberry	25.00	13.00	1.80	12.00	51.80

In the above table the figures are no more than an approximation of the ordinary cost of the operation, assuming a fair degree of efficiency. They represent the average taken from more than fifty evaporators and for the sake of uniformity are here expressed in terms of an evaporator producing one ton of evaporated fruit each twenty-four hours. Wood was figured at $3.00 per cord, labor at $2.00 per day, interest at seven per cent, and depreciation at five per cent. It is interesting to note that the second highest item of expense is one that few growers consider.

Many evaporators in use at the present time represent an investment of only $1,000.00 to $1,200.00 for each ton daily capacity, others cost twice that amount for the same capacity. In making any change, then, in our present system we must keep the ratio between cost and capacity as low as it is now or even decrease the cost per ton daily capacity if we are to keep the same degree of efficiency.

There are a number of factors which determine the efficiency of the methods of handling the fruit in an evaporator. They are: Arrangement of the floor plan, length of tunnel or height of the stack, draft, source of heat, and construction of the building.

The floor plan should be arranged so that the fruit will move in one direction from the time it enters the building until it is removed as a finished product. There are many machines and devices which will reduce the number of times the fruit has to be handled. These should be considered and, where the expenditure is warranted, should be installed. The tunnels should be short since each foot added to their length means that much added to the cost of construction not only of the tunnels but of the building itself. Then very often this extra length so retards the flow of air that it defeats the purpose for which it was designed. The draft, dependent on the difference in temperature of the air inside the ventilator and that outside, should be strong. A rapid flow of air at a low temperature will often give better results than the same amount of air heated to a higher temperature and moving more slowly. In long tunnels and closely built stacks the flow of air is usually too much retarded for best results.

The source of heat has not received the attention its importance would demand. The essential requirements of a "stove" or "furnace" are few, but the manner in which they are connected with the chimney or the amount of space they are required to heat are the factors determining their efficiency. Large pipes, with little reduction in diameter from furnace to flue, are desirable. A large chimney provided with a damper is necessary for best results with any stove or furnace. Overloading a stove or requiring it to heat too large an area shortens its life and reduces its efficiency. The space heated by each stove should be no more than can be maintained at the desired temperature with a moderate fire. The need of a forced draft or of keeping the draft wide open is a sure indication that the furnace is overloaded and that a great deal of heat is being lost through the chimney. By having each stove in a separate pit one or more units of an evaporator may be used without the expense of heating others. The cold air intakes may be placed in a number of ways so long as they are kept below the furnace.

In the building itself strength and good construction should predominate. Outside walls should protect all the vital parts from drafts of cold air and sudden changes of the wind. In the construction of the furnace pit and the tunnels every effort must be made to prevent a loss of heat. Tunnel walls and ceilings should be double walled with a dead air space between. Inlet and outlet openings for the

heated air should be provided with doors so that the flow of air can be controlled at all times. Simplicity of design, good construction, economical arrangements of working parts, a controlled flow of heated air passing rapidly over the fruit, and a proper adjustment of capacity to the heating surface, all combine to produce a good quality of evaporated product at a low cost.

EVAPORATION OF APPLES

A Paper Read by D. A. Snyder, of Dayton, Oregon, at the Twenty-Eighth Annual Meeting of the Oregon State Horticultural Society

This subject does not appear to be of much importance. So we thought at first, but the more we study the subject the more important it appears. From the earliest time, the preservation of fruit in the "harvest season," to be consumed during the dormant season or time of failure, has been one of the problems of man. The savage used the bark of trees and flat stones on which to spread his berries and fruit, to be exposed to the sun until dried. Our forefathers in this country spread the fruit on racks or cloths, which were placed on a roof or on the ground to be dried in the sun, or in many instances racks were hung over the cookstove in the kitchen and the fruit spread on them and dried.

In some parts of Europe it is still customary to string quartered apples on strings and hang them from the ceiling over the stove, where like other primitive methods, 'midst dust and flies, they will eventually dry and will keep, to be used when wanted. We frequently find people who say they prefer apples dried under such a process to those cured in a modern evaporator. They are certainly like the lady who had always lived in the city and went to the country to spend the summer, only remaining a few days, giving as her reason that she could not eat the country food. Among other things with which she found fault was the butter—it had no taste; and the milk was so poor that, if it stood over night, a yellow scum would come to the top of it, and she did not think it was fit for food.

We have three ways or methods of curing apples—drying, evaporating and dehydrating. It would be difficult to distinguish between the definitions of the terms given in the dictionary; still they are not the same in meaning, and there is still greater difference in the methods pursued in curing the fruit. Dried apples, in the common acceptance of the term, applies to apples cured after the primitive methods just described, or in dryhouses, so-called. When a small lad, my father had a dryhouse on his farm in Ohio, and it was my duty to pick up apples in the orchard, wheel them in in the wheelbarrow and pare them with a small parer (used at that time), quarter and core ready for the dryhouse—thus getting my first lessons in the fruit business, which has since become my life work. This dryhouse was a small building about ten by twelve feet, built perfectly tight, so as to hold all the heat. A box stove was placed in the center of the building, with wooden racks arranged around the sides and ends of the room, and over the top of the stove. On these racks were placed the quartered apples. The room was heated to the highest possible degree and the apples, in spite of their bleeding and sweating, would in time get dry. Many of the dryhouses were made of logs, and we have been told that from one of these log houses was discovered the theory of the modern evaporator. The chinking between the

lower logs had fallen out, and the roof being made of shakes, a circulation of heated air resulted. The owner noticed that his apples were drying faster and much nicer than they did before, and thinking that the draft might be the cause, increased the size of the holes, which caused still better results. Thus was born the idea of evaporating with a hot air circulation.

By evaporated apples we mean apples cured in an evaporator, by means of warm dry air passing rapidly between and through the pieces of apples and carrying off the moisture, leaving the fruit dry. There are a great many styles and makes of evaporators, but we think they can all be classed under four general types. We will not endeavor to describe all the types, as it would take too much time, but will mention each and try to describe two which our experience teaches us are best. As our subject is drying apples, we will not discuss the evaporators which are best calculated for the evaporation of prunes and berries, but only as to the adaptation to evaporating apples.

The evaporator which is perhaps being used most extensively for evaporating apples is the hop-kiln type evaporator. This is built similar to a double hop kiln, with a room adjoining in which the apples are pared and bleached. The drying floor is about ten or twelve feet from the ground and made of slats or strips, closely laid, so as to allow the hot air to pass through the fruit above, but not let the pieces of apples fall through. The furnace or stove is placed on the ground under the floor. It is ventilated by doors underneath and a ventilating tower in the center above each kiln, which causes a strong current of hot air to pass through the fruit, carrying off the moisture. The apples are pared and cored by machines, after which they are trimmed, the trimmer cutting out all the bad places and removing such pieces of peeling as the machine fails to remove. The apples are then bleached whole and run through a slicing machine, after which they are spread on the kiln floor several inches deep to evaporate. It is necessary to turn the fruit while curing. This undoubtedly is the cheapest method of evaporating apples, and with the latest improved machinery it is possible to operate with a very small outlay of labor. An evaporator of this type can be so constructed that apples can be dumped from the wagon into a hopper and by means of conveyors conveyed to the parer by automatic machines then by conveyor to bleacher, from there to the slicer, then to the kiln floor, the only handling necessary being the trimming, which can be done by trimmers, watching the apples as they pass on the conveyor, picking up and trimming such as may need it, and the remainder passing on untouched. The drawback to this type of evaporator is that it can only be used successfully in evaporating apples. And the quality of the product, while nice looking, is not up to some others, owing to the fact that it is so long from the time the apple is pared and sliced before it is sealed over that it bleeds badly, thus losing much of the flavor of the apple and will not have as white nor as nice an appearance when cooked.

The type of evaporator we like best, and the kind we are using, is constructed in such a way that the cold air is admitted at the bottom and passes through past the furnace and hot pipes, becoming thoroughly heated and dried, so that nothing but dry air reaches the fruit. The fruit is spread on trays placed in the kiln in a slanting position, so as to permit the dry air to pass through between them, both over and under the fruit, thus absorbing and carrying off the moisture without causing the moisture from one tray to pass through the fruit in the other trays. This causes the slices of apple to seal over

quickly and stops the bleeding, thus retaining all of the natural flavor. To pare our apples we use the Rival apple parer, fitted with the slicing attachment. This machine pares, cores and slices the apple and delivers it into an inclined shoot, which carries it to the trimmer and spreader, who trims out all bad parts and spreads the apples onto the trays. The tray is then put into the bleacher, after which it is placed in the evaporator and remains there until it is fully cured. The disadvantages of this type of evaporator are that it requires more labor than the hop-kiln type, and it costs a great deal more to construct. The advantages are: It is a general evaporator—in it we evaporate every kind of fruit and vegetable, also eggs. The quality of the product is superior to that produced by any other type so far as we have seen. The other two types of apple evaporators are the so-called stack evaporator type and the like-fresh type. Both are good and by some thought best of all, but we prefer the other two types.

There are a number of large evaporators which operate on apples in this State. We have two in Yamhill County, one at Amity and our own at Dayton. Besides these, there are a number of small evaporators in different parts of the county. The output of our evaporator this season will be about 120,000 pounds of evaporated apples, equal to about 25,000 boxes, or thirty-one cars of fresh apples. We do not know the capacity of other evaporators nor the amount of the annual production in this State, but New York State produced 2,000 carloads of evaporated apples in 1912. This was equal to 20,000 cars of fresh apples; as California, Missouri, Arkansas, Michigan and Pennsylvania are all large producers of evaporated apples and will not fall far behind New York, we believe it is safe to say that not less than 10,000 cars of evaporated apples, equal to 100,000 cars of fresh apples, were produced in the United States in 1912. As very few apples, other than culls, which would otherwise go to waste, get to the evaporator, we can readily see what an important place in a community is filled by the evaporator. Another feature is the labor employed. As it takes fifteen people six weeks to evaporate a car of apples, it would require at least 150,000 persons to put up the 10,000 cars.

In addition to the evaporated apples, there are the byproducts of the evaporator to take into account. Some evaporators evaporate the peelings and cores which are used by large packers to make jellies, while others press the juice from them for vinegar purposes. At our evaporator we have made about 25,000 gallons of juice for vinegar this season, being about one gallon from the waste of each box of fresh apples evaporated. This reduces the cost of evaporated apples materially. The market for evaporated apples is limited. Of the 2,000 cars produced in New York in 1912, 600 cars were still on the market a short time ago. A large part of the evaporated apples put up in this country are consumed in Europe, the remainder is consumed mostly in our own large cities, in the prairie states, in sheep, cattle, mining and logging camps, in the fisheries and ship stores and a very small part going into the southern hemisphere and across the Pacific.

The consumption of evaporated apples is curtailed to a great extent by dishonest packing. Men running camps tell us that it is a common occurrence when buying a box of evaporated apples to find the top, bottom and sides of the box lined with nice white slices and the inside filled up with burned, unpeeled and wormy stuff, unfit for food. For this reason they prefer to use prunes and peaches or canned apples; while they cost more, they can eat them when they get them to the camp. Others use too much water in packing, thinking to gain a few pounds weight, and causing the whole box to ferment and spoil. We

evaporators should see to it that our fruit is packed honestly and put on the market in proper shape. Then it might be well to try educating the public taste to consume it. Few people really know the value of evaporated apples as a food, or for that matter how to cook them. If properly cooked it is hard to discern the difference between stewed fresh and stewed evaporated apples. And if properly evaporated and baked, we defy anyone to discern the difference between a fresh or evaporated apple pie. A short time ago we shipped 150 fifty-pound boxes of evaporated apples to a large pie baker. These will all be used in making pies and they will undoubtedly be sold as fresh apple pies.

We hear a great deal of talk about the high cost of living, and feel it ourselves as well as others, but this could be lessened a great deal if people would only use the right judgment in what they eat. We stood in a grocery store in one of the Coast cities of Washington, one day in May, when a lady entered and purchased two dozen small, shriveled held over apples, paying fifty cents for them. The grocer told me she was the wife of a sawmill employe. This set us to thinking and wondering what she could do in the way of furnishing her table with food with those apples. We concluded that she might make two, possible three, pies, and have an apple each for the family to eat for dessert. She could have purchased from the same grocer our own pack of evaporated apples, for the same money (fifty cents), enough evaporated apples to equal a whole box of good, fresh apples, which would have furnished her family with pies, puddings and apple sauce, all they could eat for weeks.

A great many people are asking the question what are we going to do with our apples when the new orchards all come into bearing? Don't smile; it is not a foolish question, and more people are worried over this question than are willing to admit it. In times past attempts have been made to have laws passed which, if rigorously enforced, would freeze out the small orchards, hoping by that means to curtail the supply on the market. Other places resort to the expediency of having inspectors condemn everything coming to their market from neighboring states, and passing freely the home grown. Shame on such expedients. Retribution is in store for them. If the price of apples was within the reach of all classes there would be no cause for anxiety, as they would all be eaten and more called for. But, says the grower, we cannot produce them cheaper. There are so many culls that the first class apples cost us too much to produce. True, but if you could sell your culls and waste apples for seven or eight dollars per ton in bulk, the first class apples would not cost so much. This could be done if everyone could or thought they could afford to eat apples.

The evaporator could afford to pay you eight dollars per ton for your culls and sell the evaporated apples at a price which would admit of them being sold at retail in any city in the United States at a price that would be equal to not exceed seventy-five cents a box for fresh apples. Even the poorest could have all the apple sauce they could eat if they only knew it, and would if they knew.

If every inhabitant of the United States would eat one pound of evaporated apples each year it would be equivalent to 18,000,000 boxes of fresh apples. Would not the best solution of the problem be: Pack only the best apples for the fresh apple market and evaporate and can all of the off grades? In this way pests would not be spread, the grower could sell all of his apples and the poor could have apples to eat.

ORCHARD SURVEY OF KLAMATH COUNTY

Report of E. C. Chandler, County Agriculturist, August 22, 1914

The orchard survey was made for the purpose of finding out as nearly as possible, from the experience of those who have been growing fruit, whether or not the growing of fruit for home use and for local markets would be profitable and practical in Klamath County; what sections of the country are best adapted to fruit growing; the kinds and varieties of fruits which do best here; the diseases and insects that are doing damage to the fruit and trees, and to get in touch with the farmers who have fruit trees.

This survey was started July 20 and finished August 21 during which time 163 orchards were visited containing approximately 11,645 trees, 7,676 bearing trees and 3,969 trees not yet of bearing age. I traveled approximately 320 miles in making this survey.

Most of the orchards visited were small home orchards, only seven of them containing as many as 400 trees and the largest one only 600 trees. Most of the larger orchards and those which have been most successful are located along the foothills or high up in the hills where they are protected from the cold winds and frost. Some of the orchards on the low lands have been quite successful where windbreaks of poplar trees have been planted around them. A freeze in June caught a great deal of the fruit this year, but where the orchard is protected from the northwest and furnished with good air drainage there is a good crop of fruit. One orchardist succeeded in saving a part of his fruit by smudging and could have saved all of it had he been prepared to do so, although the temperature got as low as twenty-two degrees F. that night. I found that where the trees were protected from the north and west they bore some fruit almost every year and had a full crop much oftener than where unprotected. The older trees also seemed to bear much more regularly than the younger ones.

The sections which seemed to be best adapted to fruit are: Along Link River and on the southeast slopes near Klamath Falls, along the hills north of Algoma, and in similar locations throughout the county where the hills gave protection on the north and west. Apples, prunes, plums and cheries can be raised on nearly every farm in the county for home use by furnishing a windbreak, and there are certain localities where fruit can be raised very profitably on a commercial scale for use in Klamath County, and I see no reason why Klamath County should not raise all of these fruits consumed here except in very unfavorable years.

The worst pests of the fruit business besides the frosts are the fire blight and aphis and some farmers complain of borers injuring and killing the young trees. Of these the fire blight is by far the most common and most serious, thirty-eight per cent of the orchards visited having blight in them. Some of these were badly infested while others had only a small amount of it but it seems to be spreading quite rapidly in the county and steps should be taken to prevent its spread. The growing of pears is not practical now on account of this disease and it is causing quite heavy losses of apple trees where proper care is not given them.

In choosing varieties for Klamath County a quick maturing variety is essential on account of the short growing season and I found that as a rule the summer and fall varieties do best here but they mature much later here than they do in most fruit sections and keep much longer, thus some of the summer apples are fall apples here and some of the fall apples are winter apples in Klamath County. For summer